The NASA Deferred Maintenance Parametric Estimating Guide

Version 5

For NASA's
Facilities Engineering and Real Property Division

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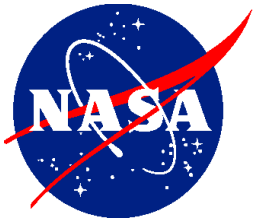

National Aeronautics and Space Administration

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1. Purpose

This guide describes the NASA Deferred Maintenance (DM) Parametric Estimating Method. The DM Method was developed and tested in 2001, and fully implemented on *all* NASA facilities to produce the Agency estimate of Deferred Maintenance for the annual Agency Accountability Report. The DM Method will be used annually to determine the level of deferred maintenance and the facility condition index (FCI) within NASA's facilities inventory. The DM estimate and facility condition index information provide meaningful indicators for NASA management, and are an indicator of the level of stewardship of NASA facilities.

2. Background

All Federal agencies have struggled to find an efficient and effective method to produce accurate deferred maintenance estimates. In the late 1980's Congress focused attention on the rising levels of BMAR reported by the Department of Defense (DoD). Despite a decade of maintenance and repair funding increases to reduce maintenance backlogs, DoD's BMAR estimate increased in the early 1990's. DoD installations reacted to the increased funding by spending more resources on studies and inspections to further increase their BMAR estimates (in hopes that even more funding would be forthcoming). This result weakened DoD's credibility with Congress, and has been a source of concern over the last decade.

Within NASA, BMAR estimates have historically been used: to support the Agency's Annual Accountability Report; as a functional performance metric trended over time; and as a reference point when reviewing annual maintenance budgets. The Federal Accounting Standards Advisory Board (FASAB) requires Federal agencies to comment on deferred maintenance in their Annual Accountability Reports. Previously, NASA relied upon a 1997 Facility Investment Study (FIS) as the basis for this deferred maintenance estimate. Auditors reviewing the FY 2001 Accountability Report concluded the dated FIS would no longer provide an acceptable basis for the Agency deferred maintenance estimate.

In response to this audit finding, the NASA Facilities Engineering Division, "Code JX," in cooperation with the NASA Comptroller, chartered the development of this new DM method based on a white paper by Charles B. Pittinger, Jr., P.E., dated April 8, 1999 and a National Research Council, Federal Facilities Council Standing Committee on Operations and Maintenance Technical Report #141, titled, *Deferred Maintenance Reporting for Federal Facilities.* The DM method provides an independent, consistent, cost–effective, and auditable approach to estimating Agency facilities deferred maintenance. The DM method was reviewed and found to be acceptable for its intended use by a nationally recognized audit firm, and a nationally known economist. The cost to generate the initial DM estimate was less than one cent per square foot (at least an order of magnitude less than other facility condition assessment methods). The resulting DM database provides NASA facilities managers a valuable tool for making strategic decisions regarding the NASA facilities inventory.

3. The NASA DM Method – An Overview

The condition assessment in the ***NASA Method*** begins with a rapid visual inspection of nine different building elements within each facility at an installation. Site visits are conducted using two-person teams; one person for architectural building elements and one person for mechanical/electrical elements.

The assessors rate each of the following nine building elements or systems, based on the American Society for Testing of Materials (ASTM) UNIFORMAT II, Classification for Building Elements, from five (Excellent - Only normal scheduled maintenance required) to one (Bad - Major repair or replacement required to restore function, unsafe to use) for 42 different facility categories.

- Structure – foundations, slabs, floors, pavements
- Roof – roofing, gutters, flashing
- Exterior finishes – walls, windows, doors
- Interior finishes – floors, walls, ceilings, doors, stairs
- Electrical – distribution, lighting, other wiring/controls
- HVAC – HVAC and other mechanical systems
- Plumbing – water, sewer, fire protection piping
- Conveying – cranes, elevators, hoisting equipment
- Program Support Equipment – test, research, program equipment

When the assessments are complete, the ratings are placed in a Microsoft Access© database where the parametric model converts the assessed condition ratings into three useful sets of metrics. All three are capable of providing information in a variety of ways (by systems, facilities, type of facilities for sites, and by Agency hierarchy) for use by facilities managers.

- **System Condition Index (SCI)** – The SCI is a rating derived from the condition assessment ratings for one of the nine building systems, such as structure, electricity, or plumbing. The SCI helps a facility manager determine if a particular building system, (i.e. roof) is in poor condition requiring a higher priority maintenance effort or budgeting.
- **Facilities Condition Index (FCI) -** This is the key rating for the facility manager because it enables him to compare a facilities condition in a variety of ways to determine repair/renewal and budgeting priorities. However, it is not the traditional FCI, which equates to the DM ÷ CRV. The building FCI is a simple calculation that weights each of the nine system condition ratings by its associated system CRV percentage per each of the 42 facility categories. In each system, the rating is multiplied by its system CRV percentage to get a weighted SCI. The sum of the nine weighted SCIs equals the facility's FCI. A facility's FCI is the CRV normalized sum of the condition ratings for each system within each facility. In other words, facilities or systems with a higher CRV contribute more to the overall FCI.
- **Deferred Maintenance Cost Estimate (DM)** – Although not recognized in the commercial world, deferred maintenance has been used in Federal agencies to indicate the degree of facilities work that has been deferred for budgetary reasons and

that is required to restore the facilities to a good, usable condition. When tracked and trended over time with other basic facility performance metrics such as the Annual Cost of Maintenance and Repair, and Facility Reliability and/or Facility Availability, the effectiveness of a maintenance and repair program can be evaluated. Additionally, FASAB has recently relied upon deferred maintenance as a tool to reflect the degree of unfunded liability due to an agency's under funding of facilities maintenance and repair in their annual Chief Financial Officer's reports.

This process of documenting deferred maintenance is designed to be a simplified approach based on existing empirical data in a parametric model. For example, detailed cost estimates for the repair of a building system (e.g., its plumbing system) can be developed using very precise work measurement standards. However, if history has demonstrated that repairs (as the dependent variable) have normally been valued at about 25% of the original value (the independent variable), then a detailed estimate need not be performed and can simply be computed at the 25% CER level.

It is important to note that any CERs used can be carefully tested for validity using standard statistical approaches. The ***NASA Method*** CERs are based on exceptionally good costing models. The first step in the model, the current replacement value system percentage, is derived from the *Parametric Cost Estimating System (PACES)* [1], an accepted estimating tool for federal construction projects. The *PACES* method was derived from an evaluation of more than $40 billion of federal facilities projects. The second step, system condition percentages for each of the nine systems per each of the five ratings, was developed using estimated original construction cost using *RSMeans™ CostWorks 2002 Version 6-1* [2] estimating tools.

"The DM methodology is a promising approach for estimating NASA deferred maintenance requirements. Its data collection process and cost estimation procedure both represent significant improvements over established procedures such as the U.S. Army ISR [Installation Status Report]. The consistency of its ratings in repeated trials is impressive and well documented. The cost estimation procedure is conceptually sound."

Whitestone Research
(July 2002)

[1] *PACES* is an integrated PC-based parametric budgeting and cost estimating system developed by Earth Tech (http://earthtech.talpart.com.) that prepares parametric cost estimates for new facility construction and renovation. It was developed for military facility application and will soon be commercialized for use in the general building, industrial facilities, and transportation industries. *PACES* is available to military personnel via the U.S. Air Force. A U.S. Government employee can obtain a copy of the current military version of *PACES* by contacting the Air Force Civil Engineer Support Agency.

[2] R.S. Means. CostWorks 2002 Version 6.1; 1996-2002. *RSMeans* is North America's leading supplier of construction cost information. A product line of Reed Construction Data, *RSMeans* provides accurate and up-to-date cost information that helps owners, developers, architects, engineers, contractors, and others to carefully and precisely project and control the cost of both new building construction and renovation projects.

4. The NASA DM Method - Details
4.1 Purpose

The DM Method will be used annually to determine the level of deferred maintenance and the facility condition index (FCI) within NASA's facilities inventory. The DM estimate and facility condition index information provide meaningful indicators for NASA management, and are an indicator of the level of stewardship of NASA facilities. The DM Method provides deferred maintenance estimates for a large population of facilities across the entire Agency. Application of these DM data to a single or small group of facilities may produce misleading results, and likely will not match detailed Backlog of Maintenance and Repair (BMAR) estimates generated by other means, although FCIs are applicable to individual systems and facilities.

4.2 Facility Systems

The DM Method is based on an assessment of nine systems for each facility. From an assessment of other deferred maintenance estimating methods that use building systems and the American Society for Testing of Materials (ASTM) UNIFORMAT II Classification for Building Elements, the following nine systems were selected for the NASA DM Method:

- Structure: Foundations, superstructure, slabs and floors, and pavements adjacent to and constructed as part of the facility (i.e., sidewalks, parking lots, access roads)
- Roofing: Roof coverings, roof openings, gutters and flashing
- Exterior: Exterior coatings and sealants, windows, and doors
- Interior Finishes: All interior finishes on walls, ceilings, floors, and stairways, as well as interior doors
- HVAC Systems: Heat, ventilating and air conditioning systems including controls; may include exhaust fans, or other mechanical equipment associated with indoor air quality
- Electrical Systems: Electrical service and distribution within five feet of the facility, lighting, communications systems (phone, LAN), security and fire protection wiring and controls
- Plumbing Systems: Water, sewer and fire protection piping, including bathroom fixtures
- Conveyance Systems: Elevators, escalators, cranes, hoists, or other lifting mechanisms
- Program Support Equipment: Test, research and specialty equipment (installed real property, vs. personal property associated with laboratory or testing operations) required to support testing and laboratory functions. This system normally only exists in a limited number of DM facility categories

4.3 Deferred Maintenance Database

The foundation for the NASA DM Method is the deferred maintenance database. Appropriate fields from the NASA Real Property Inventory (RPI), including facility number, description, CRV, capacity, first year (essentially the year the original facility was constructed), and NASA facility class are imported to the NASA Deferred Maintenance Database. Data for each RPI listed facility should be imported into the DM database each year, with caution exerted to ensure the appropriate CRV value is included. Additional fields within the database include: DM Categories, system condition ratings for nine systems, System CRV Percentages, System

Condition CRV Percentages, DM estimates per system and for the total facility, Facility Condition Indexes (FCI), and System Condition Indexes (SCI).

Individual database fields and their descriptions in the "facilities table" within the database follow:

4.3.1 Enterprise/Center/Site/Installation. Describes the primary NASA Center (and subordinate site or installation as appropriate) where the facilities reside. The "site" category includes subordinate organizations such as, Deep Space Network (DSN), Transoceanic Abort Landing Sites (TALS), Spaceflight Tracking and Data Network (STDN), Bilateration Ranging Transponder (BRT), Very Long Baseline Interferometry (VBLI) sites, and Mobile Laser Sites (MOBLAS). This database consists of *all* facilities that NASA owns including those remote and low value sites that may not be visited but will be assessed using the approved method found in paragraph 5.

4.3.2 Facility Number. The facility number assigned by the NASA Center taken from the RPI. This number does not change, and identifies the specific facility in question.

4.3.3 Facility Description. This field provides a brief description of the facility taken from the RPI.

4.3.4 Status. Lists whether the facility is active or inactive, (inactive sites include mothballed, abandoned, in or out grant, and heritage). Awareness of the facility status will assist the assessor in evaluating the time required and expected condition of the facility. Taken from the RPI

4.3.5 CRV (20 Cities Average). This amount is taken from the RPI. It is the primary cost input for developing the deferred maintenance estimate, and the basis for system CRV percentages used later in the spreadsheet. Note; users will need to ensure they have extracted the correct CRV from the RPI for each years DM assessment. *The Center CRV's do not include the book value of the Center's land. This value is zeroed in the database.*

4.3.6 CRV Exclusion and % Excluded. Some NASA facilities are no longer actively used. This inactivity is reflected by an entry in the CRV Exclusion field, taken directly from the NASA RPI. The year the facility was removed from inventory, and percentage of the total facility removed (some continue to be partially used), are reflected in the CRV Exclusion fields. *Excluded values are included* in the database to determine the full value of NASA's deferred maintenance.

4.3.7 Capacity. This provides the quantity and unit of measure for the facility as reflected in the RPI. This information helps the assessor estimate time required to conduct the assessment.

4.3.8 1st Year. Provides the year the original facility was built. Provides the assessor a reference point on the age of the facility.

4.3.9 NASA Class Code. The NASA facility class code for the facility from the RPI.

4.3.10 Deferred Maintenance Category. NASA has more than 400 different facility "Classes." These classes have been grouped into 42 "Deferred Maintenance Categories." Each category has a separate cost model with specific CRV contributions for each facility system. Section 4.4 give a detailed explanation, and Table 1 shows the mapping of the NASA classes in to the Deferred Maintenance Categories.

4.3.11 Facility Systems. There are a series of fields to reflect the major systems to be assessed. For each of the nine systems (Structure, Roof, Exterior, Interior, HVAC, Electrical, Plumbing, Conveying, Facility Equipment), these four sub-fields are provided:

4.3.11.1 System CRV Percentage. The percentage contribution of this system to the overall facility CRV for this facility category. The percent system CRVs were developed from the Parametric Cost Estimating Systems (*PACES*) parametric estimating program. The final percent system CRV's were adjusted based upon actual assessments of NASA facilities during the 2002 DM assessment. These adjustments take into account actual composition NASA's facilities inventory. See Section 4.5 and Table 2 for the table of percentages and a detailed explanation.

4.3.11.2 System Condition Rating. The rating assigned by the assessor, from 5 (like new) to 1 (cannot support the mission). A rating of 0 is assigned if the particular systems does not exist (i.e., towers have no "interior"). See Section 4.6 and Table 3 for a detailed explanation.

4.3.11.3 System Condition CRV Percent. This percent is taken from a table based upon the system assessment rating for a given system. For example, a system assessment rating of 4 for an HVAC system produces a 2% CRV condition contribution, which factors into the facility deferred maintenance estimate. Section 4.7 and Table 4 give a detailed explanation and shows the System Condition CRV Percentage.

4.3.11.4 System Deferred Maintenance. A formula driven field, which is the product of facility CRV, System CRV Percent, and System Condition CRV Percent.

4.3.12 Facility Deferred Maintenance. This field is the sum of all nine System deferred maintenance fields. The total of this column for a given Center produces the overall Center deferred maintenance estimate. The total of all Centers deferred maintenance estimates is the Agency deferred maintenance estimate. Section 4.9 gives a detailed example of the computation.

4.3.13 Facility Condition Index (FCI). This is the weighted sum of condition ratings for all nine-facility systems. For each Center, the FCI is the weighted average of all nine systems for all Center facilities. For NASA it is the weighted average of all nine systems for all facilities. If a system does not exist where a System percentage is indicated, then that system's percentage is re-distributed to the

structure system. Section 4.8 and Table 5 give a detailed example of this computation.

4.3.14 System Condition Index (SCI). This is the weighted average of the systems similar to the FCI from the component level to the agency level.

4.4 Deferred Maintenance Categories

Table 1 provides the mapping of the more than 400 five digit NASA facility classes into the 42 DM Category Codes. The DM Category Codes are intended to capture facilities of similar types. The intent is for the majority of facilities in each DM Category to have similar System CRV Percentages for each of the nine facility systems. For example, on average across a large population of facilities, most administrative facilities will have facilities systems make up, and therefore similar CRV percentages for the nine systems within the DM Method (i.e., most Administrative Building roofs account for about 6% of the total Facility CRV).

Within Table 1, categories listed as "buildings" will normally have most of the nine systems within the DM Method. However, categories listed as "facilities" may not be traditional buildings; they may include utility distribution systems (no roofs, interiors, etc.) or antennas (also without all nine systems).

Table 1. Deferred Maintenance Category Codes and Mapping of NASA Class Codes (continued next page)

Facility Type	**NASA Facility Category Class**
R&D and Test Buildings	220-11, 220-12, 220-13, 310-10, 310-15, 310-20, 310-21, 310-22, 310-30, 310-40, 310-41, 310-50, 310-60
R&D Structures and Facilities	320-10, 320-20, 320-21, 320-22, 320-30, 320-40, 320-41, 320-50, 320-70, 390-00
Wind Tunnels	330-10, 330-20, 330-30, 330-40, 330-60, 330-70, 331-10, 331-20, 331-30, 331-40, 331-60, 331-70
Engine/Vehicle Static Test Facilities	340-10, 340-20, 345-10, 345-50, 350-10, 350-20, 355-10, 355-20, 355-30, 355-40, 355-50
Administrative Buildings	141-20, 610-10, 610-20, 610-90
Training Buildings	171-00, 179-00
Trailers	630-30, 630-31, 630-32, 630-34, 630-36, 630-37
Storage Buildings	153-10, 153-90, 442-10, 610-30
Storage Facilities	345-20, 421-30, 432-10, 432-90, 442-20, 442-30, 442-40, 442-50, 442-60, 442-90, 452-10, 452-11, 452-12, 471-10, 471-20, 471-30, 471-40
Fuel Storage Tanks	126-90, 411-10, 411-20, 411-30, 411-40, 411-50, 411-60, 411-90, 423-10, 423-20, 423-90, 461-10, 461-20, 461-30, 461-90
Specialized Liquid Storage Tanks	
Fueling Stations and Systems	121-10, 121-20, 121-90, 122-10, 122-20, 122-90, 123-10, 123-90
Magazines	421-90, 422-15, 422-20, 422-30, 422-90, 424-10, 424-20, 424-30
Communication and Tracking Buildings	131-10, 131-15, 131-20, 131-25, 131-30, 131-35, 131-40, 131-45, 131-50, 131-90, 140-10, 140-20, 140-30, 140-40, 140-50, 140-90
Communication and Tracking Facilities	132-10, 132-20, 132-30, 132-40, 132-50, 132-90, 141-30, 141-40, 141-50, 141-90
Large Antennas	
Small Antennas	320-60
Mission Control Operations Buildings	381-10
Lighting	136-10, 136-20, 136-30, 136-50, 136-90, 812-20, 812-40, 812-50, 812-70, 812-80
Electrical Distribution System	382-70, 811-90, 812-30, 812-35, 812-90

Facility Type	**NASA Facility Category Class**
Power Generation/Power Plant	811-10, 811-20, 811-30, 811-40, 811-50, 811-60, 811-70, 811-80
Electric Substations, Switchgear & Transformer Yards	812-10, 812-60
HVAC Distribution	822-10, 822-20, 823-20, 823-30, 824-10, 824-20, 824-30, 824-40, 842-10, 890-10, 890-15, 890-20, 890-25, 890-30, 890-35, 890-45, 890-50, 890-60, 890-65, 890-70, 890-85, 890-90
HVAC Generation	821-10, 821-20, 821-30, 821-40, 821-50, 890-40, 890-55, 890-75, 890-80
Waste Water Collection & Disposal System	831-20, 832-10, 832-20, 832-30, 832-40, 832-90, 871-60
Waste Water Facilities & Treatment Plants	831-10, 831-30, 831-40, 831-50, 831-90
Storm drains, Ditches, Dams, Retaining walls	871-10, 871-20, 871-30, 871-40, 871-50, 871-90
Potable Water Distribution System	345-40, 841-20, 841-30, 841-35, 841-40, 841-45, 841-50, 841-55, 842-12, 842-15, 842-30, 842-35, 843-10, 843-20, 843-30, 843-40, 843-50, 843-60
Potable Water Facilities & Treatment Plants	841-10, 841-70
Launch Pads	382-10, 382-11, 382-14, 382-60, 382-80
Launch support camera pads	382-13
Launch propellant & high pressure gas facilities	382-30, 382-31
Pavement	111-10, 111-11, 111-12, 111-20, 111-21, 111-22, 112-10, 112-11, 112-12, 113-20, 113-21, 113-22, 141-10, 851-10, 851-11, 851-12, 851-20, 851-22, 851-90, 851-91, 851-92, 852-10, 852-11, 852-12, 852-20, 852-21, 852-22, 852-30, 852-31, 852-32, 852-90, 852-91, 852-92, 860-10, 860-30, 860-40
Rail	
Maintenance Facilities and PW Shops	219-10, 219-11, 219-20, 220-10
Operational maintenance facilities	212-10, 212-20, 212-30, 212-40, 212-50, 220-14
Other Buildings	381-20, 381-30, 381-40, 381-50, 381-60, 382-15, 510-00, 641-10, 641-20, 641-30, 641-40, 711-00, 712-00, 730-10, 730-20, 730-25, 730-40, 730-65, 730-70, 730-90, 740-18, 740-26, 740-30, 740-33, 740-40, 740-43, 740-46, 740-53, 740-54, 740-56, 740-73, 740-76, 740-83, 740-88, 740-90, 740-95, 872-20, 872-30, 872-90
Other Facilities	126-10, 152-20, 152-40, 152-60, 152-90, 154-10, 154-20, 154-30, 154-90, 163-10, 163-20, 163-30, 163-90, 164-10, 164-20, 164-30, 164-90, 361-10, 361-20, 361-30, 361-40, 631-10, 631-20, 631-30, 631-40, 690-10, 690-20, 690-90, 750-10, 750-20, 750-30, 750-40, 750-50, 750-60, 750-90, 750-95, 833-10, 833-20, 833-30, 833-40, 833-90, 860-20, 860-50, 860-90, 872-10, 872-40, 872-50, 880-10, 880-20, 880-30, 880-40, 880-50, 880-90, 890-95
Land & Easements	911-10, 911-20, 911-21, 911-22, 911-30, 911-31, 911-32, 911-33, 911-40, 911-50, 912-10, 912-11, 912-13, 912-20, 913-10, 913-20, 913-30, 913-40, 913-50, 913-60, 913-61, 913-62, 913-63, 914-10, 914-20, 921-10, 921-20, 921-30, 921-40, 921-50, 921-60, 921-90, 922-10, 922-20, 922-30, 923-10, 923-20, 923-40, 923-50, 923-60, 932-10, 932-20, 932-30, 932-40, 932-50, 932-60, 932-90
Compressed Air Distribution	
Compressed Air Generation	
Prefabricated buildings, various uses	620-10, 620-90, 630-10, 630-11, 630-12, 630-14, 630-16, 630-17, 630-20, 630-21, 630-22, 630-24, 630-26, 630-27
Berthing and Housing	

Table 1. Cont

4.5 System CRV Percentages

Each NASA facility has a CRV listed in the RPI. The DM method prorates the total facility CRV among the nine facility systems. The DM method includes different System CRV percentages for each of the 42 DM Categories. The System CRV percentages for each category were derived using the *PACES* model. Table 2 provides the system CRV percentages as modified based upon *PACES* data and actual experience applying the DM method during the 2002 NASA DM assessment. Some systems within a category may contain a zero percentage.

This indicates those systems are typically not expected for that facility type (for example, DM Category 21, Pavements, only includes a percentage for structure; no other systems are anticipated for pavement facilities).

Table 2. System CRV percentages (continued on next page)

DM Code	NASA_BLDG	STRUC	EXT	ROOF	HVAC	ELEC	PLUMB	CONV	INTF	EQUIP	SUM
0	Uncategorized Facility/Building	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	R&D and Test Buildings	0.18	0.19	0.04	0.15	0.20	0.04	0.01	0.15	0.04	1.00
2	R&D Structures and Facilities	0.40	0.17	0.01	0.06	0.25	0.02	0.02	0.03	0.04	1.00
3	Wind Tunnels	0.30	0.05	0.01	0.01	0.15	0.01	0.01	0.01	0.45	1.00
4	Engine/Vehicle Static Test Facilities	0.38	0.03	0.01	0.04	0.26	0.01	0.03	0.02	0.22	1.00
5	Administrative Buildings	0.19	0.17	0.06	0.16	0.18	0.05	0.03	0.16	0.00	1.00
6	Training Buildings	0.18	0.20	0.05	0.12	0.21	0.05	0.01	0.18	0.00	1.00
7	Trailers	0.20	0.19	0.06	0.18	0.20	0.02	0.00	0.15	0.00	1.00
8	Storage Buildings	0.60	0.15	0.10	0.04	0.06	0.01	0.00	0.04	0.00	1.00
9	Storage Facilities	0.55	0.22	0.11	0.03	0.04	0.01	0.00	0.04	0.00	1.00
10	Fuel Storage Tanks	0.70	0.13	0.02	0.00	0.10	0.05	0.00	0.00	0.00	1.00
10.1	Specialized Liquid Storage Tanks	0.51	0.13	0.02	0.00	0.14	0.20	0.00	0.00	0.00	1.00
10.2	Fueling Stations & Systems	0.40	0.10	0.05	0.05	0.15	0.20	0.00	0.05	0.00	1.00
11	Magazines	0.33	0.30	0.05	0.06	0.15	0.02	0.00	0.09	0.00	1.00
12	Comm. & Tracking Buildings	0.21	0.20	0.05	0.16	0.18	0.05	0.00	0.15	0.00	1.00
13	Comm. & Tracking Facilities	0.55	0.10	0.02	0.05	0.26	0.00	0.00	0.02	0.00	1.00
13.1	Large Antennas	0.20	0.20	0.02	0.05	0.15	0.02	0.01	0.02	0.33	1.00
13.2	Small Antennas	0.50	0.30	0.00	0.00	0.10	0.00	0.00	0.00	0.10	1.00
14	Mission Control Operations Buildings	0.22	0.13	0.05	0.15	0.20	0.04	0.02	0.10	0.09	1.00
15	Lighting	0.17	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	1.00
16	Electrical Distribution System	0.39	0.03	0.00	0.00	0.58	0.00	0.00	0.00	0.00	1.00
16.1	Power Generation/Power Plant	0.30	0.10	0.05	0.10	0.39	0.01	0.00	0.05	0.00	1.00
16.2	Electric Substations, Switchgear & Transfer Yards	0.10	0.07	0.00	0.00	0.83	0.00	0.00	0.00	0.00	1.00
17	HVAC Distribution	0.30	0.10	0.00	0.00	0.33	0.27	0.00	0.00	0.00	1.00
17.1	HVAC Generation	0.20	0.10	0.05	0.35	0.10	0.15	0.00	0.05	0.00	1.00
18	Waste Water Collection & Disposal System	0.50	0.02	0.02	0.00	0.05	0.41	0.00	0.00	0.00	1.00
18.1	Waste Water Facilities & Treatment Plants	0.34	0.10	0.05	0.03	0.15	0.32	0.00	0.01	0.00	1.00
18.2	Storm drains, Ditches, Dams, Retaining walls	0.90	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	1.00
19	Potable Water Distribution System	0.38	0.05	0.02	0.00	0.05	0.50	0.00	0.00	0.00	1.00
19.1	Potable Water Facilities & Treatment Plants	0.25	0.05	0.05	0.03	0.24	0.37	0.00	0.01	0.00	1.00
20	Launch Pads	0.51	0.10	0.03	0.03	0.25	0.04	0.02	0.02	0.00	1.00
20.1	Launch support camera pads	0.80	0.10	0.00	0.00	0.10	0.00	0.00	0.00	0.00	1.00
20.2	Launch propellant & high pressure gas facilities	0.48	0.05	0.02	0.00	0.20	0.25	0.00	0.00	0.00	1.00
21	Pavement	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
22	Rail	0.95	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	1.00
23	Maintenance Facilities & Public Works Shops	0.20	0.14	0.06	0.13	0.30	0.09	0.00	0.08	0.00	1.00
23.1	Operational maintenance facilities	0.20	0.14	0.06	0.13	0.28	0.09	0.02	0.08	0.00	1.00
24	Other Buildings	0.22	0.15	0.12	0.10	0.15	0.11	0.00	0.15	0.00	1.00
25	Other Facilities	0.71	0.10	0.02	0.05	0.10	0.01	0.00	0.01	0.00	1.00
26	Land & Easements	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
27	Compressed Air Distribution	0.50	0.00	0.00	0.00	0.10	0.40	0.00	0.00	0.00	1.00

27.1	Compressed Air Generation	0.25	0.10	0.05	0.05	0.15	0.35	0.00	0.05	0.00	1.00
28	Prefab buildings, various uses	0.18	0.17	0.05	0.15	0.15	0.15	0.00	0.15	0.00	1.00
29	Berthing & Housing	0.15	0.17	0.09	0.16	0.18	0.07	0.02	0.16	0.00	1.00

Table 2. System CRV Percentages

4.6 Condition Assessments

The assessment teams assign a condition rating from 5 to 1 for each facility system based on a systematic visual assessment and limited Center inputs. The general definitions for each rating are:

- **5: Excellent**. Only normal scheduled maintenance required.
- **4: Good**. Some minor repairs needed. System normally functions as intended.
- **3: Fair**. More minor repairs and some infrequent larger repair required. System occasionally unable to function as intended.
- **2: Poor**. Significant repairs required. Excessive wear and tear clearly visible. Obsolete. System not fully functional as intended. Repair parts not easily obtainable. Does not meet all codes.
- **1: Bad**. Major repair or replacement required to restore function. Unsafe to use.
- **0**: **Non-existent.** The zero rating identifies that this system does not exist within the facility.

While the general definitions provide an overall framework for how systems are rated, the following discussion and Appendix D provide specific guidance to ensure assessments are done consistently for each of the nine systems within a facility.

4.6.1 Structure

For traditional buildings, the assessment of structure includes the foundation, and structural integrity of walls, floors, stairwells and loading docks. For most facilities, structure also includes the paved areas immediately surrounding the facility, including sidewalks and parking lots. When rating structure the assessor must consider the relative value of the paved areas compared to the overall facility. For smaller facilities, the paving may constitute a larger percentage; in this case, the paving condition should play a larger part of the structural rating for that facility. For very large and high value facilities, the paving is typically a lower percentage, and therefore will have less impact on the overall structural rating assigned.

Care must be exercised when rating the structural systems. Many of NASA's facilities are more than 40 years old, and show evidence of settling and cracking. While these are not ideal conditions, in many cases this evidence of damage does not represent a significant risk to the facility, and would not warrant a repair project. If the settling or cracking is not severe and there is no obvious need for an immediate repair, the structural rating should be lowered no more than 1 rating.

Assessments of paving should focus on the pavement structure (deep cracking or settling would indicate a sub-surface failure, and dictate a more expensive repair), as well as the pavement surface (to include the need for seal coating of asphalt pavements).

For non-traditional buildings (antennas, tanks, pads, etc.), structure involves assessing the slab, supporting members, and adjacent pavements of the facility. Assess the overall condition, with focus on the need for maintenance or repair projects.

4.6.2 Roof

Assessors can anticipate many different roof types (e.g., built up, rubber membrane, metal seam) throughout the NASA inventory. The differing roof types present different challenges for the assessors. Ratings should consider the amount of problems identified. The criteria suggest assessors should look for positive drainage. If ponding exists on a roof, one isolated incident on a large roof should not dictate a reduction in the rating; such a problem would need to be more widespread before reducing the rating.

Rubber membrane and built up roofs will show signs of aging and weathering, and roof patches will be visible to indicate past failures of portions of the roof. A visual assessment from atop theses roofs should provide adequate evidence to support a condition rating. Roofs covered in rock need to be walked and checked for evidence of bubbling or cracking. Assessors can gauge the integrity of the roof by the feel underfoot (check for air pockets, bubbling, or soft spots). For roofs with very low ratings, one should expect to see visual evidence or hear reports of leaking within the facility.

Metal seam roofs may not show signs of prior maintenance. These roofs usually leak at their seams, and repairs may be effected from underneath the roof. When assessing metal seam roofs, the assessor will need to check for evidence of leaks from within the facility, or inquire regarding past problems during the assessment.

Although age of the roof should be considered (especially for built up roofs), assessors should not arbitrarily reduce the roof ratings due to the age. In older buildings, it is likely that the roof is not original, and therefore the age of the building should not be a criterion when assessing the roof.

4.6.3 Exterior

The exterior rating includes the wall coverings (e.g., paints, rust proofing, stucco), sealants (including caulking at expansion joints, doors and windows), doors and windows. For metal structures corrosion control is an element of the exterior rating. Assessors must be careful not to confuse exterior and structural ratings; evidence of structural cracking, vs. cracking in stucco or other exterior applications must be distinguished.

The rating for exterior must be based upon the entire facility appearance and condition. Some facilities are made up of multiple additions, or have differing conditions on different facades due to weather or aesthetic considerations.

The age of windows and doors can be a consideration in the rating for exterior. Many older NASA facilities still have single pane, lower efficiency windows and doors.

During the next scheduled repair it would be prudent in most cases to replace the older, less efficient windows and doors with more modern components. Exterior can be downgraded one level if the volume of these older components is significant.

For some non-traditional facilities, the exterior system is not rated (i.e., electrical distribution systems).

4.6.4 Interior Finishes

The interior rating includes all interior finishes, including flooring, walls, ceilings, and doors. As with exterior, the rating for interior must be based upon a whole building assessment. Assessors should walk through a representative sampling of interior spaces to judge the age and condition of interior finishes.

Warehouses and shop facilities do not dictate exceptional interior finishes. Assessors should consider whether the condition and appearance of the interior finishes is appropriate for the intended facility usage.

Many non-traditional facilities will not have interior spaces. The DM method does not assess the interiors of storage tanks, pressure vessels, or liquid distribution systems. These facilities should receive a zero rating for interior.

4.6.5 HVAC Systems

The HVAC system includes all equipment associated with air movement, heating, or cooling within the facility. For simple facilities, it may consist of the roof mounted, wind driven exhaust fan.

Assessors should consider the overall condition of the systems, assessing a representative sampling of systems throughout the facility. Steam or condensate piping within a facility that is fed from a central plant should be rated under Plumbing.

Assessors should look at the overall condition of equipment. If a majority of HVAC system equipment is more than 20 years old, ratings should be lowered by one level. If a majority of equipment is more than 30 years old, ratings should be lowered by two levels. Assessors must exhibit judgment when rating HVAC systems, focusing on the condition of higher value, larger system components (i.e. chillers.).

Assessors should also evaluate the automated digital controls (if present) of HVAC systems. Older systems may not have any, or may have obsolete digital controls. This should be a factor in the overall rating.

Non-traditional facilities may not have HVAC systems, and should receive a zero rating for this system.

4.6.6 Electrical Systems

The electrical system includes all transformers, switch gear, distribution systems, panels, and lighting within a facility. It also includes electrical components of security, communication, and fire protection systems.

Assessors should focus on the condition and appearance of maintenance or repairs within the electrical systems. Age is a significant factor in rating electrical systems. Those that are more than 20 years old should receive a downgrade of one level. Those that exceed thirty years should receive a downgrade of two levels. The assessor must not arbitrarily judge the electrical system based upon the age of the facility; he or she must visually assess a representative sampling of equipment to determine its age and condition.

Less complicated facilities may have very little electrical service. Some storage facilities may have no electrical service, and should have a zero rating for this system.

4.6.7 Plumbing Systems

Plumbing includes all piping conducting fluids within the NASA facilities. Typically it includes water, condensate, and sewage piping, but it may also include piping for specialized fluids and gases.

Assessors should look for obvious signs of leaks or prior repairs in these systems. For traditional facilities, plumbing also includes the fixtures within restroom and shower facilities, and this system can be downgraded one level based upon the age and condition of piping and fixtures in these areas.

Plumbing systems will not be rated for exterior. Insulation or other coatings should be considered a part of the piping itself; deteriorated coatings can contribute to downgrading of the plumbing system.

4.6.8 Conveyance Systems

Conveying includes all elevators and escalators, and cranes and hoists that are permanent parts of the facility. Due to safety considerations, conveying systems typically must be certified annually. If the conveying within the facility is operating the assessors should assume it is certified, and therefore at a minimum should receive no less than a 3 rating.

Conveying systems in abandoned buildings likely are not certified, and should receive no higher than a 3 rating.

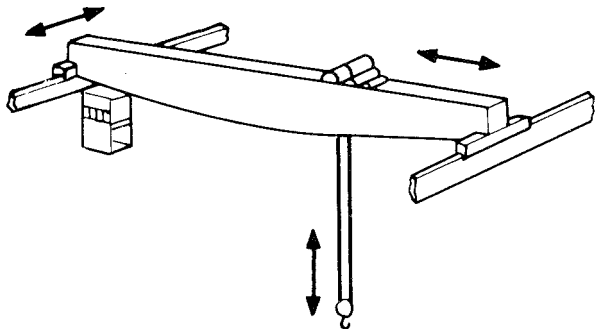
Age of conveying systems is a factor, and systems should be downgraded by one level if they are more than 30 years old.

4.6.8.1 Stationary Cranes

There are many types of stationary cranes to be found today in industry. The ones listed here are the most likely types to be found at a NASA facility. The definitions and descriptions found here are from the ASME B30 1998 standards. Also note that these cranes are considered stationary because they are part of a building or structure dispite the fact that they have some mobility within the facility. During your visits you will notice many cranes that are not part of the facility

and have to ability to move from facility to facility for construction and repairs. They are referred to as mobile cranes are not part of the NASA RPI and are not accessed in this process.

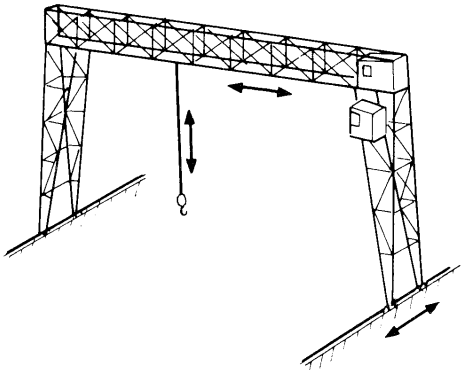
Overhead Crane – ASME B30.17 *a crane with a movable bridge carrying a movable or fixed hoisting mechanism(s) and traveling on a fixed overhead support structure.*



These units can be overhung or underhung. They can be manually operated, control power operated or automated. They will have trolley's in which the hoist are mounted on that travel the length of the bridge giving them 3 axis of travel for movement of loads.

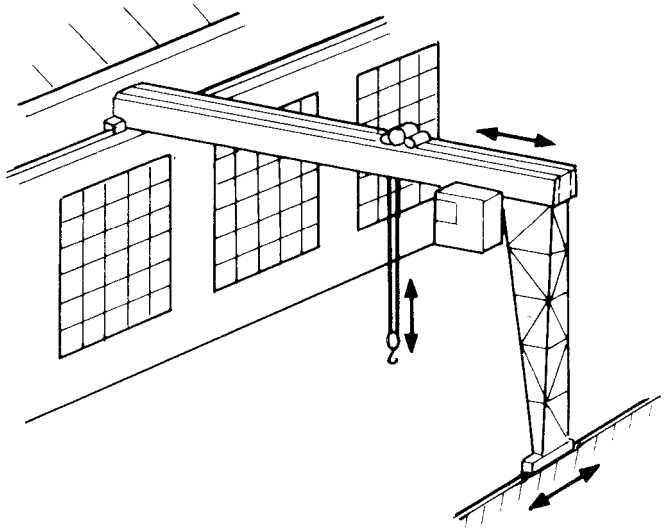
DM Assessment Note:
All overhead cranes of this type should be assessed regardless of the tonnage. The support columns and travel beams that support the rails that the bridge travels on are a part of the cranes structural system.

Gantry Crane – ASME B30.17 *a crane similar to an overhead crane, except that the bridge for carrying the trolley or trolley's is rigidly supported on two or more legs running on fixed rails or other runway.*



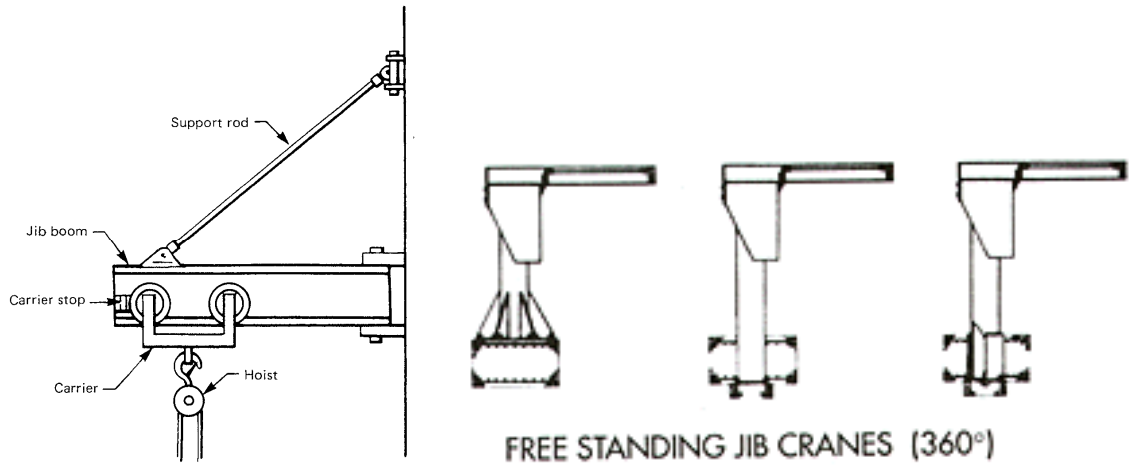
DM Assessment Note:
All gantry cranes of this type should be assessed regardless of the tonnage. The support the rails that the gantry travels on are a part of the cranes structural system.

Semigantry Crane- ASME B30.17 *a gantry crane with one end of the bridge rigidly supported on one or more legs that run on a fixed rail or runway, the other end of the bridge being supported by an end truck running on an elevated rail or runway.*



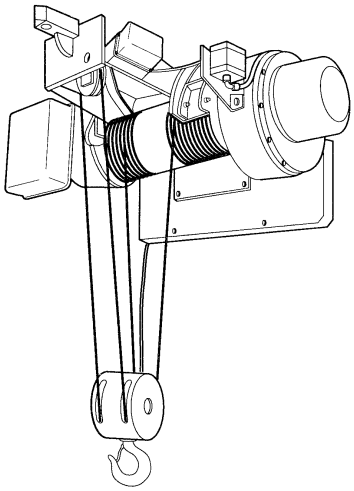
DM Assessment Note:
All gantry cranes of this type should be assessed regardless of the tonnage. The support the rails that the gantry travels on are a part of the cranes structural system.

Jib Boom Crane – ASME B30.11 *a crane with a horizontally cantilevered track for supporting the carrier.*



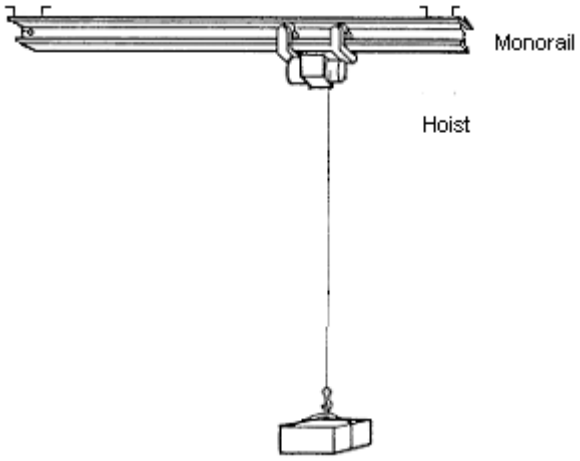
DM Assessment Note:
Only Jib Boom Cranes with permanently mounted electric or pneumatic hoist and load capacity of 10 tons or greater will be accessed.

Overhead Hoist **–** ASME B30.16 *all manually or power operated hoists for vertical lifting service.*



DM Assessment Note:
All of the cranes mentioned in this section will include there own hoists. The hoists on those units are considered part of the crane. In this type we are specifically targeting the hoists that are mounted in a fixed structure. An example of this is at JSC in Building 49 there are 2 towers and each have a 75 ton hoist mounted in the top of the structure. These hoists can only lift and lower a load they have no ability to move the load in any horizontal directions. Hoist of this type with electric or pneumatic drives that have a lift capacity of 20 tons or greater will be accessed.

Monorail- ASME B30.11 *a single run of overhead track on which carriers run.*



DM Assessment Note: These are very common units in NASA for movement of small light loads and are found with manual and automated hoists and trolleys. The monorail is permanently fixed to the structure and this system only allows for the load to move in two axis. There movement is confined to the vertical axis of the lift and the direction travel of the trolley on the monorail. The hoists and trolleys on monorails are often moved from area to area as needed. Systems of this type will only be accessed if the trolley and hoist are permanent units with electronic or pneumatic controls and the lift capacity is 20 tons are greater.

4.6.9 Program Support Equipment

Program Support Equipment includes collateral[3] type equipment ***solely*** required to support operations or research within the facility. Special air conditioning, electrical service, pumps, motors, exhaust systems, pressure vessels, piping, hydraulics, or other equipment needed to sustain operations or research is included within Program Support Equipment.

Program Support Equipment is expected to exist only in the following DM Facility Categories:

- 1 – R&D & Test Buildings
- 2 - R&D Structures and Facilities
- 3 - Wind Tunnels
- 4 – Engine/Vehicle Static Test Facilities
- 13.1 – Large Antennas
- 13.2 – Small Antennas
- 14 – Mission Control Operations Buildings

For most facilities outside these categories, Program Support Equipment should receive a zero rating. Special equipment within boiler plants or other infrastructure related facilities is not Program Support Equipment.

For larger antennas, hydraulics, motors, pumps, and other associated equipment in support of the antenna operations should be rated as Program Support Equipment.

4.7 System Condition CRV Percentage

A significant component of the DM estimate is the application of a system condition CRV percentage based on the assigned condition rating for each system. The system condition CRV percentages, based on existing engineering data, increase as the condition of the system gets lower ratings, creating a larger DM estimate. For example, if the structure of a facility receives a 5 rating its contribution to DM is 0% because there is typically no deferred maintenance for this rating. However, if the structure received a 3 rating its contribution to the deferred maintenance will be 10% of the CRV of the building. The system condition percentages also vary by system. A 3 rating for the electrical system will contribute 13% of the CRV to the DM, or the plumbing system with a 2 rating will contribute 57% of the CRV to DM. These percentages vary by system, and are provided in Table 3.

[3] NASA Policy Guidance (NPG) 8831.2D defines Collateral Equipment as :Encompasses building-type equipment, built-in equipment, and large, substantially affixed equipment/property and is normally acquired and installed as part of a facility project as described below

a. Building-Type Equipment. A term used in connection with facility projects to connote that equipment normally required to make a facility useful and operable. It is built in or affixed to the facility in such a manner that removal would impair the usefulness, safety, or environment of the facility. Such equipment includes elevators; heating, ventilating and air conditioning systems; transformers; compressors; and other like items generally accepted as being an inherent part of a building or structure and essential to its utility. It also includes general building systems and subsystems such as electrical, plumbing, pneumatic, fire protection, and control and monitoring systems.

b. Built-in or Large, Substantially Affixed Equipment. A term used in connection with facility projects of any type other than building-type equipment that is to be built in, affixed to, or installed in real property in such a manner that the installation cost, including special foundations or unique utilities service, or the facility restoration work required after its removal is substantial.

SYSTEM	5	4	3	2	1
STRUC	0	1	10	25	150
EXT	0	1	10	50	101
ROOF	0	9	38	75	150
HVAC	0	2	13	63	133
ELEC	0	2	13	63	133
PLUMB	0	2	10	57	121
CONV	0	2	13	50	100
INTF	0	1	10	50	101
EQUIP	0	2	13	50	100

Table 3. System Condition CRV Percentages

The system condition CRV percentages were developed based upon review of typical costs for major and minor repair projects for the given systems, and upon engineering judgment. These percentages may need to be adjusted over time if results indicate deferred maintenance contributions that are inconsistent with known costs for expected repairs.

4.8 System Condition Index (SCI) and Facility Condition Index (FCI) Calculations

SCI is calculated by first determining the CRV of the system in question by multiplying the facility CRV by the percent system CRV. The value of these system CRVs are then totaled. Next, the system CRV for each facility is normalized or weighted by dividing the system CRV by the sum of all the system CRVs. This quotient is then multiplied by its respective assessment rating. These "weighted" SCI are then added together to determine a systems SCI. The active and inactive sites use the same methodology, using facilities at sites instead of systems. The SCI calculation can be calculated for the site, installation, Center, Enterprise, or Agency levels. Table 4 is an example using the structural system as an example.

Facility	CRV	DM Category	System CRV Percentage (Structure)	Assessed Rating	System Value (CRV*System CRV %)	Normalization to value of system (System Value/ Total System Value)	SCI (Normalized value * Assessed Rating)
N200	$12,392,787	5	0.19	5	$2,354,630	0.028739789	0.143698943
N201	$6,424,036	5	0.22	3	$1,413,288	0.017250101	0.051750302
N202	$5,822,212	5	0.19	5	$1,106,220	0.013502140	0.067510699
N202A	$1,477,062	1	0.22	4	$324,954	0.003966271	0.015865084
N203	$11,164,122	1	0.22	4	$2,456,107	0.029978385	0.119913541
N203A	$14,182	25	0.9	5	$12,764	0.000155791	0.000778953
N204	$17,561,478	5	0.19	5	$3,336,681	0.040726365	0.203631825
N204A	$790,405	1	0.19	4	$150,177	0.001833008	0.007332030
N205	$328,338	3	0.76	5	$249,537	0.003045760	0.015228802
N206	$158,490,513.00	3	0.3	5	$47,547,154	0.580344014	2.901720069
N206A	$22,117,872.00	3	0.31	5	$6,856,540	0.083688545	0.418442725
N207	$64,259,365.00	1	0.22	4	$14,137,060	0.172552038	0.690208153
N207A	$9,018,845.00	1	0.22	4	$1,984,146	0.024217794	0.096871177
	$55,974,622				$81,929,257		4.7

Table 4. Example SCI calculations using "structure"

The FCI is CRV normalized sum of the condition ratings for each system within each facility. In other words, facilities or systems with a higher CRV contribute more to the overall FCI. The building FCI is a simple calculation that weights each of the nine system condition ratings by its associated system CRV percentage per DM category as found in Table 2. In each system, the rating is multiplied by its system CRV percentage to get a weighted SCI. The sum of the nine weighted SCIs equals the facility's FCI. Table 5 is an example.

		STRUC		EXT		ROOF		HVAC		ELEC		PLUMB		CONV		INTF		EQUIP		FCI
Facility Description	**Facility CRV $**	Insp Rat	% Sys CRV	Insp Rat	% Sys CRV	Insp Rat	% Sys CRV	Insp Rat	% Sys CRV	Insp Rat	% Sys CRV	Insp Rat	% Sys CRV	Insp Rat	% Sys CRV	Insp Rat	% Sys CRV	Insp Rat	% Sys CRV	
WAREHOUSE	1,172,019	4	0.40	3	0.19	2	0.06	0	0.18	3	0.20	0	0.02	0	0	3	0.15	0	0	**3.3**
COVERED STORAGE	102,267	5	0.63	5	0.22	5	0.11	0	0.03	5	0.04	0	0.01	0	0	0	0.04	0	0	**5.0**
FEMA EQUIPMENT STORAGE SHED	92,789	5	0.48	5	0.17	5	0.05	0	0.15	5	0.15	0	0.15	0	0	5	0.15	0	0	**5.0**
GENERAL WAREHOUSE	7,781,631	4	0.60	4	0.15	4	0.10	3	0.04	3	0.06	4	0.01	0	0	4	0.04	0	0	**3.9**
ADMINISTRATION BUILDING	12,166,903	5	0.19	5	0.17	3	0.06	4	0.16	4	0.18	4	0.05	5	0.03	5	0.16	0	0	**4.4**
AUDITORIUM	6,306,944	3	0.22	4	0.17	4	0.06	4	0.16	2	0.18	4	0.05	0	0.03	2	0.16	0	0	**3.1**
MAIN LIBRARY	5,716,090	5	0.19	4	0.17	4	0.06	4	0.16	4	0.18	4	0.05	4	0.03	4	0.16	0	0	**4.2**
PHOTOTECHNOLOGY LAB.	10,960,633	4	0.18	3	0.19	4	0.04	3	0.15	4	0.20	4	0.04	5	0.01	5	0.15	5	0.04	**3.9**

Table 5. Facility FCI Example

Table 6 is an example of an FCI for a Center. The Center FCI value is a sum of each facility's CRV normalized FCI. Each facility CRV is divided by the total Center CRV. That quotient is then multiplied by each facility's FCI producing a CRV normalized FCI. (Weighted FCI = (Facility CRV÷ Center CRV) × Facility FCI). The sum of these weighted facility FCIs provides a total Center FCI.

Center "A"		**Facility FCI**	**Weighted FCI**
Facility Description	**Facility CRV $**		
WAREHOUSE	1,172,019	3.3	0.1
COVERED STORAGE	102,267	5.0	0.0
FEMA EQUIPMENT STORAGE SHED	92,789	5.0	0.0
GENERAL WAREHOUSE	7,781,631	3.9	0.7
ADMINISTRATION BUILDING	12,166,903	4.5	1.2
AUDITORIUM	6,306,944	3.1	0.4
MAIN LIBRARY	5,716,090	4.2	0.5
PHOTOTECHNOLOGY LAB.	10,960,633	3.9	1.0
Center "A" Totals	**44,299,276**		**3.9**

Table 6. Center FCI Example

4.9 Deferred Maintenance Calculation

The facility DM estimate is determined by adding the deferred maintenance estimates of the nine facility systems. Table 7 provides a sample deferred maintenance estimate for an administrative facility (DM category 5) with a CRV of $10 million.

System	System %	CRV Total $	System Rating	System Condition CRV %	DM $
Structure	0.18	1,800,000	5	0.00	0
Exterior	0.17	1,700,000	4	0.05	85,000
Roofing	0.05	500,000	4	0.05	25,000
HVAC	0.16	1,600,000	3	0.15	240,000
Electrical	0.18	1,800,000	4	0.05	90,000
Plumbing	0.05	500,000	3	0.15	75,000
Conveying	0.06	600,000	5	0.00	0
Interior Finishes	0.15	1,500,000	3	0.20	300,000
Facility Equipment	0.00	0	0	0.00	0
Total	**1.00**	**10,000,000**			**$815,000**

Table 7. Sample Deferred Maintenance Calculation

5. Deferred Maintenance Assessment Procedures

At least four weeks prior to the site visit, the assessment team leader assigned to a given Center should make contact with the designated Center point of contact (POC). During this initial discussion the assessment team leader should clearly articulate assessment support requirements, including escorts, special access, need for security assistance, transportation issues, or other needs.

The assessment team and appropriate Center staff (maintenance staff and other Center staff with an interest in the assessment) may wish to receive a short in-brief on the first morning of the assessment. The in-brief should include introductions, an overview of the Center, and any significant current events concerning facilities by the Center staff. The assessment team leader will describe the assessment process and intended work plans for the visit. The assessment team and Center staff should agree on requirements for access, escorts, schedules and receipt and review of any pertinent information from the Center to assist in the assessment.

During the assessment walk through, Center facility maintenance staff may provide short, notional facility history information for HVAC, electrical, plumbing, conveying and program support equipment systems for each facility.

For facilities that cannot be visually assessed (i.e., underground utilities), assessors should arrange for interviews with site staff most knowledgeable on the condition of these facilities, and base their assessment on facts related to their condition. Center fire departments may have a summary of fire department assessments including both the alarm and plumbing systems. If available, assessors may consider them in their evaluations, if appropriate.

The preferred method for gathering data during the assessment is by using personal digital assistants (PDAs) with the alternate being a check sheet. Two major software components are required to allow an assessment team to use the electronic data capture method that has been developed for the NASA Deferred Maintenance/Parametric Estimating project. The first is the desktop software that allows a PDA to communicate with a desktop or laptop computer. The second is a database application for PDAs.

Databases for each assessment team containing the facility or building records (i.e., CRV, size, age, facility number) for each major NASA Center will be created for each site to be visited. These databases (loaded onto a Palm or PocketPC (WindowsCE) PDA) provide a method of electronically capturing assessment ratings, and comments for the nine systems that comprise each building/facility. The PDA database can also capture comments and numbering of pictures.

After returning from each assessment session in the field, each PDA should be synchronized with the team leader's laptop/desktop to backup the data that was just collected. This is important since it is easy to drop or loose a PDA, which would result in the loss of all the data collected since the last synchronization. Once the assessment has been completed and all PDA's have been synchronized the final time, the team leader will email each assessment team's database to the Project Manager.

Assessors should identify any obvious error in the NASA database (for example, a facility listed may have been demolished, or another facility at the Center may not be entered into the database). In these cases, the assessor should complete any assessments required, and note any discrepancies, which will be resolved by NASA Code JX after review of the facts surrounding the discrepancy.

5.1 Frequency of On-site Assessments

The intent of the NASA DM Model is to inspect every NASA facility annually. However, visiting all sites every year may prove uneconomic in subsequent years. For this reason, NASA management may determine that full assessments may occur at an interval greater than one year. Even if the full assessment is not done annually, NASA may still want some facilities assessed in the "non-visit" years to continue the trend analysis and update records. The following methods will be used for interim assessments in "non-visit" years.

5.1.1 Interim Assessments

In "non-visit" years, interim condition assessments will be updated on facilities as designated by Code JX (e.g., only on those facilities that have undergone minor or major repair projects (as determined by a review of NASA's 1509 forms), or new construction projects since the previous assessment, or catastrophic events such as floods, tornadoes, etc.) These assessments will be made using the DM method in accordance with this Guide. The assessor will rate all the systems in the facilities using information from the 1509s and the property cards. The assessors will then send the raw ratings to NASA HQ (Code JX) for inclusion in the database for updating the DM estimate and the FCI as appropriate. This simple method of annual assessment will enable NASA to continue to gather maintenance cost information in the spirit of the parametric estimate. Although limited, the interim assessments will provide sufficient information on facility conditions to allow NASA to develop a DM trend line that reflects the status of its facilities maintenance program that can be used to evaluate funding required for a successful maintenance and repair program.

5.1.2 Assessments of low and remote value sites not visited

Assessments of low value and remote sites that are not visited can be made in two ways, first, using anecdotal information and pictures from NASA employees that visit the sites regularly, and second through an RPI search and the use of the property cards within the RPI.

NASA employees can offer a description of the facilities that they visit that can be used to assign ratings to each of the systems applicable to that facility. These assessments can be supported by facility pictures, maintenance records and by using the property cards to provide general information.

Sites that are not visited by NASA employees as frequently are more difficult to assess, but because of their low value, an approximation of an assessment provides sufficient data for the DM estimate. These sites can be assessed using the property card in the RPI, including CRV, description, and the facility systems. From the property card information one can glean the basic

information required to do an assessment. Then these sites should be compared to similar facilities in the same DM category that were assessed. For example, if sites that are visited have been rated 4s and 3s then generally active sites of comparable age and structure can be assumed to be in similar condition, and deserve similar ratings. For abandoned or less active sites a similar convention can be used. If through the analysis of the data from the other site visits it was determined that over 90% of the abandoned facilities that were visited received a 1 rating, it follows that the abandoned sites not visited would be in the same condition, so on the age and likely complexity of the facility (as indicated by the CRV) the non visited sites are likely to be in a similar condition and similar ratings apply. This convention provides an acceptable and reasonable estimate within the parameters of the DM estimate; that is that over a large population of facilities the application of this convention to a very few facilities (less than 1% in number and less than .05% of the NASA CRV).

5.2 Digital Photographs

As required by the statement of work digital photographs will be taken in compressed PC-JPEG format. The digital photographs shall be examples of representative existing DM that would be suitable in impact for presentations to NASA senior management. The photographs shall have file names in a format consisting of Center, facility number, and component (i.e., MSFC4420HVAC01.jpg). All digital photographs shall also have the date the photograph was taken embedded in the image area. Image resolution shall be 72dpi for web-based presentation with the RPI. Images shall be recorded/transferred onto CD-ROMs.

5.3 GPS Coordinates

During the FY04 assessment, Global Positioning System (GPS) equipment with Wide Area Augmentation System (WAAS) (Garmin model GPS 76) was used for the first time to identify the location of every facility (map datum = WGS 84/Geoid 99). The accuracy level of between 8 and 30 feet provided by the GPS positioning will be useful for locating structures in the future, but the accuracy is not close enough for GIS surveying purposes. The use of the hand-held GPS units required an insignificant increase in the time required to access facilities due to the minutes needed to allow the units to acquire satellites at each facility.

5.4 Assessment of Facilities with a CRV over $100M

In facilities or systems with a CRV of over $100 million, or where they are a large percentage of a facility's CRV, (i.e. VAB, ARC wind tunnel, SSC test stands, etc.) a single rating change can change the DM estimate or the FCI for an the entire site. For example the VAB with a CRV in excess of $800 million (18% of the Kennedy CRV) this facility not only has a great impact on the DM estimate and FCI of Kennedy, but as almost 5% of the NASA CRV, it has an impact on the DM estimate and the FCI of NASA as a whole. For this reason, two teams will assess all facilities with a CRV over $100 million dollars. The teams will reconcile the differences between the assessments and they will determine a single rating. Because of the impact a single rating change can make on the Agency DM estimate, these ratings will then be reconciled with the previous years ratings to ensure consistency.

5.5 Facility Aging Assessment

The initial construction date for each facility is listed in the NASA RPI and is entered into the DM database. Assessors are aware of this date during their facility assessment. Assessors are advised to first complete a visual assessment of the facility. In some cases, very old facilities have been partially or completely renovated, thereby rendering the facility age unimportant. In other cases, it is apparent that major facility renovations have not occurred within the facility. The DM guidelines require assessors to consider age as a rating factor for HVAC and electrical systems. A survey by the USACE[4] states that the "Building Industry Standard for life expectancy of all five systems (HVAC, electric, plumbing, conveying, and interior) is 30 years for a commercial building." A survey of commercial insurance companies provided similar information. Most considered mechanical and electrical systems that were over 20 years old to be an "immediate red flag" and any system over 25 years old to be non-insurable.[5] Due to the critical nature of many NASA facilities, the replacement of aging, obsolete, and potentially dangerous electrical and mechanical systems should be investigated.

Assessors should downgrade HVAC and electrical systems by one rating level if systems were 20-30 years old (e.g., installed between 1970-1980). Systems installed prior to 1970 (more than 30 years old) were downgraded two rating levels. For example, if a system appeared to function properly, and by visual inspection required nothing more than normal maintenance (a "5" per criteria) but was on aggregate more than 30 years old, it was rated a "3," rather than a "5." This adjustment accounts for the need to program replacements for these systems. *However, no rating will be lowered below a rating of "2" solely for age.*

4 Sartori, Michael P., P.E., Program Manager for Operation and Maintenance, U.S. Army Corps of Engineers, "Medical Facility Life Cycle Investment Strategy." American Society for Healthcare Engineering. Dec 1997.

5 We surveyed the following commercial insurers; Farmers Insurance Group, Agent David Yeats personal interview on 2 December 2002; ReMax, broker Conrad Harper personal interview 2 December 2002; and CNA, Agent Carol Purnick personal interview on 2 December 2002.

Appendix A. Deferred Maintenance Study

Deferred Maintenance, as defined in "Deferred Maintenance/Condition Assessment Discussion Paper" dated April 8, 1999 is: "maintenance that was not performed when it should have been or was scheduled to be and which, therefore, is put off or delayed for a future period (FASAB, 1996). For purposes of this standard, maintenance is described as the act of keeping fixed assets in acceptable condition. It includes preventive maintenance, normal repairs, replacement of parts and structural components, and other activities needed to preserve the asset so that it continues to provide acceptable services and achieves its expected life.[6] Maintenance excludes activities aimed at expanding the capacity of an asset or otherwise upgrading it to serve needs different from, or significantly greater than, those originally intended."

It goes on to say, "[FASAB] Standard #6, as amended, acknowledges that facilities may differ as to the level of acceptable condition, and that this level may vary across and within agencies; therefore, the standard allows facility management to determine the condition rating. Under the standard, management may estimate the amount of deferred maintenance for its agency through condition assessment surveys, a total life cycle cost method or other methods that are similar or identical to condition assessment surveys or total life-cycle cost.

This study included research of literature, academia, Federal and state government agencies, and technical organizations (including the American Institute of Architects, Building Owners and Managers Association, and the International Facilities Managers Association) to determine if other organizations have used parametric estimating tools for assessing deferred maintenance. The study explains deferred maintenance estimating methods used by other agencies, and comments on the strengths and weaknesses of these methods.

Background

All Federal agencies have struggled to find an efficient and effective method to produce accurate deferred maintenance estimates. In the late 1980's Congress focused attention on the rising levels of BMAR reported by the Department of Defense (DoD). Despite a decade of maintenance and repair funding increases to reduce maintenance backlogs, DoD's BMAR estimate increased in the early 1990's. DoD installations reacted to the increased funding by spending more resources on studies and assessments to further increase their BMAR estimates (in hopes that even more funding would be forthcoming). This result weakened DoD's credibility with Congress, and has been a source of concern over the last decade.

Within NASA, BMAR estimates have historically been used: to support the Agency's Annual Accountability Report; as a functional performance metric trended over time; and as a reference point when reviewing annual maintenance budgets. The Federal Accounting Standards Advisory Board (FASAB) requires Federal agencies to comment on deferred maintenance in their Annual Accountability Reports.

[6] Acceptable services and condition may vary both between entities and among sites within the same entity. Management shall determine what level of service and condition is acceptable.

The most recent Agency level effort to develop a deferred maintenance estimate was the Facility Investment Study (FIS) completed in 1997. The FIS estimated deferred maintenance and alteration requirements. Since 1997, the FIS has formed the basis for the Agency's deferred maintenance estimate referenced in the Annual Accountability Reports. Auditors of the 2000 Accountability Report indicated that a new, more consistent method for estimating deferred maintenance was required for the 2001 Accountability Report.

The NASA Policy Guide (NPG) 8831.2D, *Facilities Maintenance Management*, requires periodic condition assessments of Center facilities by completing a 100 percent assessment, or by routine assessments scheduled throughout the prescribed 5-year cycle.

During Spring 2000, NASA Code JX completed a study of Center methods for developing BMAR estimates**.** Despite the NPG guidance, the study found significant variation in BMAR estimating between NASA Centers. Some Centers had well-established procedures for periodically producing BMAR reports based upon contractor assessments. Other Centers produced BMAR reports by assembling information from several sources only upon demand from NASA Headquarters. The costs and effort to assemble the Center BMAR estimates were also found to vary considerably. Funding from Headquarters is normally not provided to generate each Center's BMAR estimate. Due to these variations in estimating methods, Center generated BMAR estimates are not acceptable to satisfy the Agency requirement for estimating deferred maintenance.

The Federal Facilities Council (FFC) Standing Committee On Operations and Maintenance completed a study to identify issues related to the reporting of deferred maintenance for facilities. The study, "Deferred Maintenance Reporting for Federal Facilities: Meeting the Requirements of Federal Accounting Standards Advisory Board Standard Number 6, as Amended", reviewed deferred maintenance reporting requirements as described in the Federal Accounting Standards Advisory Board, FASAB, Standard Number 6. The study reviewed alternative options for developing credible, consistent, auditable, and cost effective deferred maintenance estimates. The FFC report can be viewed on line at http://books.nap.edu/catalog/10095.html.

The FFC study describes a number of methodologies for reporting deferred maintenance. Most of the methods use condition assessment surveys, life-cycle costs, or a combination of the two. Statistical approaches involving extrapolation to determine deferred maintenance were also reviewed in the study.

The study concluded that the current methods being used to track and report deferred maintenance are not cost-effective, and described several ongoing efforts to devise new methods that are cost effective, consistent, and accurate. The FFC study did not advocate any particular method for estimating deferred maintenance, and did not recommend any specific method.

Deferred Maintenance Estimating Methods

The following paragraphs describe several methods being used to assess levels of deferred maintenance within the facilities management industry. Only the first method described, which

measures levels of deferred maintenance based upon detailed, component level assessments, actually produces a record of facility condition. The other methods are used more for budgeting purposes, and do not produce an assessment of actual facility condition.

Deferred Maintenance Based Upon Detailed Assessments

The most common method found for estimating deferred maintenance is to perform detailed facility inspections. These facility condition inspections, normally performed by a team of skilled craftsmen and/or engineering consultants, are costly and time consuming. Average costs for this method are $0.30 to $1.50 per square foot, depending upon the inspection rigor and detail required. This method produces a database listing all identified deficiencies and cost estimates for each deficiency (which may or may not be suitable for project development purposes). Identification of deficiencies and resultant cost estimates are subject to the skill and experience of the facility inspector. Most federal agencies use this method, inspecting each facility every 3 to 5 years, or as funding allows.

FacMan Method

Western Washington University, in a joint venture with the University of Washington, developed facilities management software called Facilities Manager (FacMan), to document facility condition. FacMan uses the Construction Specifications Institute's UNIFORMAT Assembly breakdown. FacMan can be tailored to individual user desires, and is capable of handling any level of facility system detail (UNIFORMAT major systems, subsystems, or individual components). The program is based on expected life-cycle costs, not on condition assessment. When a cyclic maintenance item is not performed as scheduled it becomes part of the deferred maintenance estimate. In addition, one-time items can be manually input into the system based on field inspections. FacMan is used at Western Washington University and the University of Washington, and is also being implemented for state facilities in Wisconsin. FacMan requires users to know and enter the current age and projected life expectancy for every subsystem.

BUILDER Method

The Army Corps of Engineers Construction Engineering Research Laboratories and The University of Illinois developed a facilities management program called BUILDER. BUILDER is a computer-based program that inventories, assesses facility condition, predicts future deterioration thru modeling programs, and generates work requests for multi-year planning and budgeting purposes. Cost estimates are derived from Means, Whitestone, and DoD estimating guides. Data is used for the annual Installation Summary Report (ISR). Field inspections of buildings are used to rate the condition of building systems as green (excellent), amber (some problems), or red (poor condition).

BUILDER is a very detailed program. For each building system there are a series of 5 to 15 components that are evaluated. Facility inspectors evaluate these components to determine an overall rating (red/amber/green) for each system. The BUILDER database generates a cost estimate to bring systems back to the green condition rating. Adding the costs to convert all

building systems back to a green condition produces the equivalent of a deferred maintenance estimate for that facility.

Washington State Department Of Transportation Method

The Washington State Department of Transportation (WSDOT) developed a system to assess the criticality of its facilities. The rating produced is a combination of the importance of a particular facility and the current condition of the facility. This method does not produce a dollar estimate for deferred maintenance.

The WSDOT method uses a two-page rating format that analyzes each of nine components for each facility. Each component is inspected and assigned a numerical rating (1 = excellent to 5 = does not meet standards) based on guideline criteria. A weighting multiplier is applied based on the criticality of the individual component. The system produces a condition rating (raw number) for each facility. Higher numbers indicate more critical facility maintenance issues. For example, a facility without a fire-protection system would receive a rating of 5 for the "Safety Standards" component. Each component has a multiplier; the multiplier for the component "Safety Standards" is a 10 because it relates to life safety. The multiplier ranges from 2 to 10. The condition rating for this facility for the Safety Standard component would be a 50, (5 x 10). The total facility scores are the total of all subsystem scores. Facilities are then ranked by score, with funding priority going to facilities with the highest scores.

Facility Sustainment Model

The Office of the Secretary of Defense (OSD) has developed the Facility Sustainment Model (FSM) to determine annual maintenance funding requirements for Federal facilities. The FSM estimates the costs to sustain facilities at their current condition level. It does not assess costs for required repairs to restore facilities to acceptable condition levels. Inputs for the FSM model are: total square footage of facilities by facility category; annual cost per square foot for maintenance based upon the DoD Cost Factor Handbook; area cost factors; and inflation.

Facilities Management Institute Method

The Facility Management Institute (FMI), a subsidiary of Herman Miller, Inc., developed a formula to calculate annual maintenance costs for buildings. Building age and current value are two of the most important factors in determining maintenance costs. The method does not involve facility inspections. The deferred maintenance estimate is generated based upon a formula comparing facility age and expected useful life. As facilities age, and consume increasing percentages of their expected useful life, the deferred maintenance estimate increases. This method does not account for ongoing maintenance in facilities.

Appendix B. Deferred Maintenance Data Collection Setup & Operation

Overview

Two major software components are required to allow an inspection team to use the electronic data capture method that has been developed for the NASA Deferred Maintenance/Parametric Estimating project. The first is the desktop software that allows a Personal Digital Assistant (PDA) to communicate with a desktop or laptop computer. The second is a database application for PDA's called HanDBase.

HanDBase databases for each assessment team containing the facility or building records for each major NASA Center have been created. These databases (loaded onto a Palm or PocketPC (WindowsCE) PDA) provide a method of electronically capturing assessment ratings and comments for the nine systems that comprise each building/facility.

The planned approach to gathering the inspection data involves an assessment group for a NASA Center/Site/Installation that is composed of one or more two-person teams. An assessment group should have a desktop/laptop available that will be used to synchronize the PDA's with. This desktop/laptop must have the Palm and/or PocketPC desktop installed. Each two-person team will have one PDA to record the assessment ratings. Prior to beginning the assessment, an assessment group should verify that each PDA will properly synchronize with the desktop/laptop and that there are no conflicts between the database names installed to each PDA. One option is for the assessment group leader to provide the desktop/laptop that the assessment teams will use for synchronization.

After returning from each assessment session in the field, each PDA should by synchronized with the team leader's laptop/desktop to backup the data that was just collected. This is important since it is easy to drop or loose a PDA, which would result in the loss of all the data collected since the last synchronization.

Once the assessment has been completed and all PDA's have been synchronized the final time, the team leader will email each assessment team's database to the Project Manager.

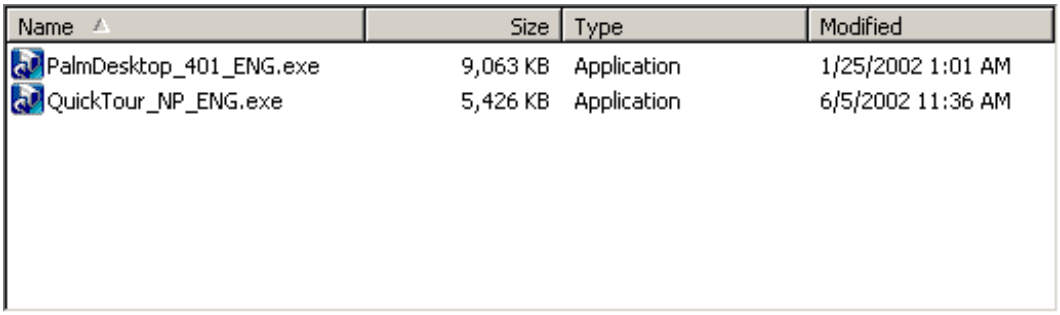
Installing Palm Desktop & HotSync Manager

The goal of this section is to install the Palm Desktop & HotSync Manager (HotSync Manager is automatically installed with the Desktop application) software to one desktop/laptop that will be used as the assessment groups "main" data repository. The Palm or PocketPC desktop/laptop software should be installed on one desktop/laptop; the desktop/laptop that will be used to synchronize the team's PDA's. If each assessment team has a laptop available, it is acceptable for an assessment team to synchronize their PDA with their laptop. Regardless, each desktop/laptop that will be used to synchronize PDA's must have the Palm and/or PocketPC software installed.

1. If you do not already have a PDA with its desktop software installed, it should be installed as instructed below before installing HanDBase. If you already have Palm Desktop & HotSync Manager software installed, continue with step 5 below.

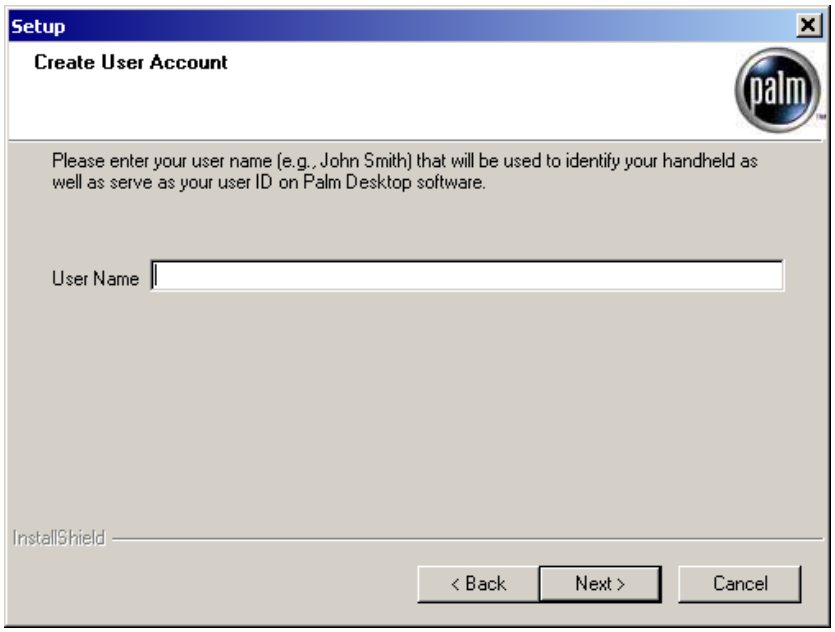
2. If a Palm based PDA was supplied to you for this project, install the Palm desktop software by double-clicking on the "PalmDesktop_401_ENG.exe" file located in the "Palm Desktop Installation Files" folder on the supplied CD, as shown in Figure 1.

Figure 1: Installing HanDBase



3. When you reach the point where it asks you for the "User" as shown in Figure 2, enter "PLEXUS 1" or "TEAM 1" or another name that will facilitate having up to four users with essentially identical PDA's. For this example, "PLEXUS 1" will be entered.

Figure 2: Enter User Name



4. If you are unfamiliar with the Palm Desktop application, Palm has provided a "QuickTour" that will provide an overview of the application. You can view/use the tour by opening the file "QuickTour_NP_ENG.exe" located in the same folder as the Palm Desktop install executable.

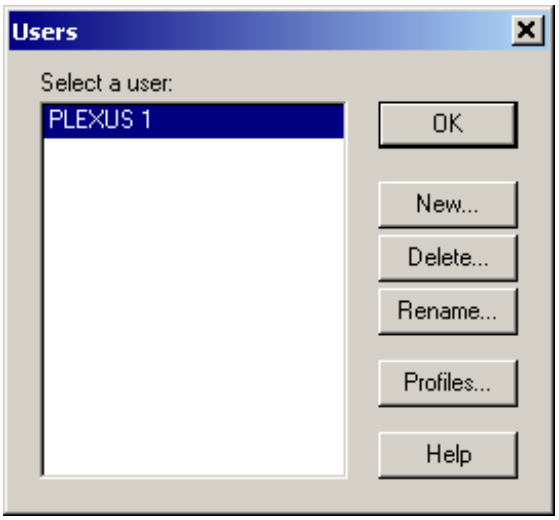
5. Once the Palm Desktop has been installed, a "User" name for each team's PDA needs to be setup. Note that if the Palm units have already been used, they will already have a "User" name. If there are multiple two-man teams with a mixture of new and used

PDA's, add user names for the **new** PDA's following steps 6 thru 9 below. If all the PDA's are new, continue with step 10 to either rename the PDA's or use them as they are

6. Start the Palm Desktop software [**Start | Programs | Palm Desktop | Palm Desktop**].

7. Menu select [**Tools** | **Users…**] on the Palm Desktop. A "Users" dialog, shown in Figure 3, will start up and should show the name of the user entered in step 3 or if you already have the Palm Desktop software installed, the name of the PDA you already use.

Figure 3: A "Users" dialog

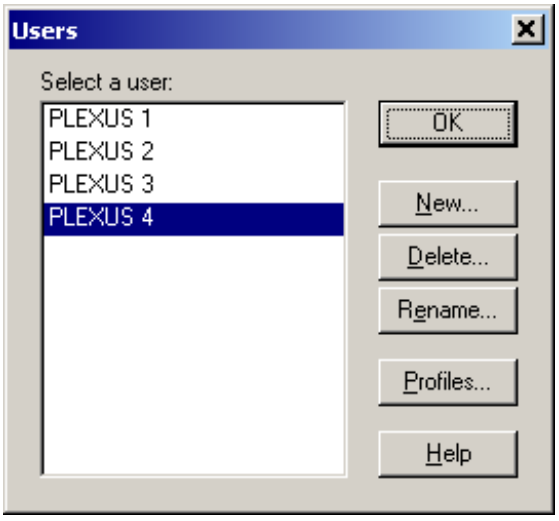


8. Next click the [**New…**] button to add a new user using the "New User" dialog, Figure 4. You will need to add one for each team's Palm PDA.

Figure 4: "New User" dialog

9. For this example, assuming a total of four two-man assessment teams, three additional users (to the first one entered in the installation process) have been added as shown in Figure 5. The additional users were named to be consistent with the user name chosen in step 3.

Figure 5: Additional User Names



10. For those PDA's already in use, simply HotSync them and the dialog shown in Figure 6 will pop up. Click [**OK**] and the user name for that PDA (Joe Smith in this example) will be added to the Users list as shown in Figure 7 and Figure 8.

Figure 6: HotSync dialog

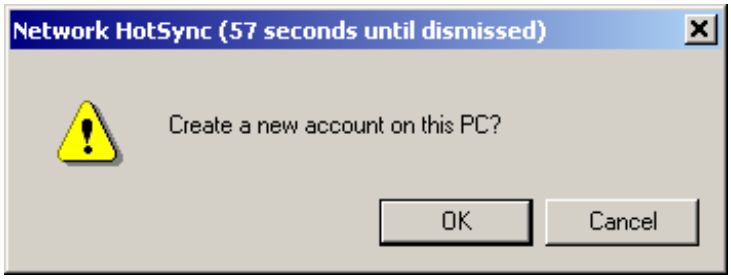


Figure 7: HotSync Progress

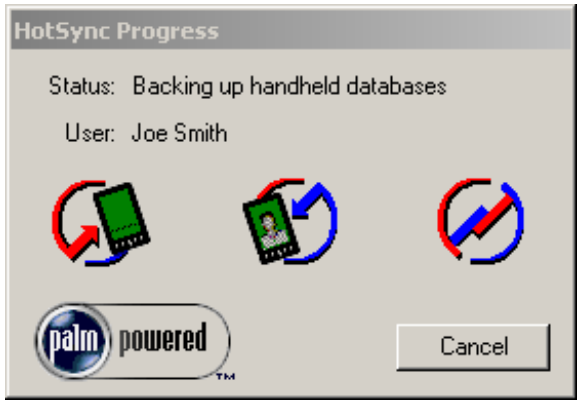
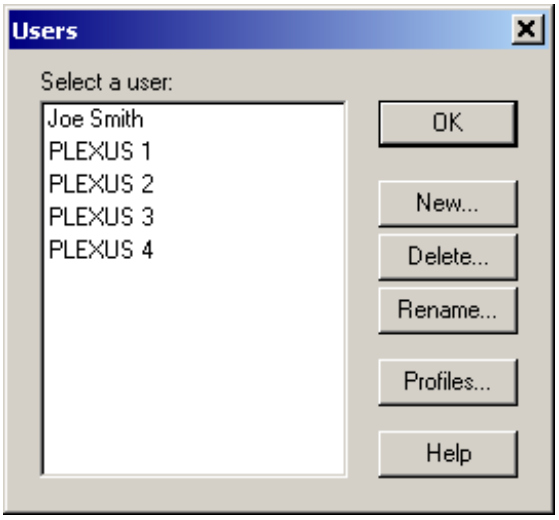


Figure 8: HotSync User list



11. At this point, the "Joe Smith" PDA can be used as is, or it can be renamed to one of the previously chosen names (PLEXUS 1, PLEXUS 2, etc). If you choose to rename the PDA, say "PLEXUS 2", the existing user "PLEXUS 2" will have to be deleted and then the "Joe Smith" user can be renamed PLEXUS 2 using the [**Rename…**] button. The names chosen for the PDA's really do not matter as long as the assessment teams and the assessment group leader keep track of the PDA each assessment team is using.

Installing HanDBase Desktop and PDA Applications

The goal of this section is to install the HanDBase Desktop on the assessment group's desktop/laptop and install the HanDBase PDA application to each team's PDA.

1. Close all the open applications you may have running in the background on the assessment group's/team leader's desktop/laptop.

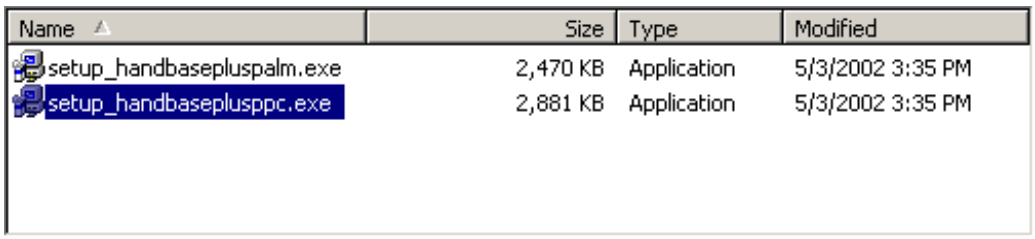
2. Using Windows Explorer, locate the "HanDBase Installation Files" folder on the provided Deferred Maintenance (DM) CD, shown in Figure 9.

Figure 9: HanDBase Installation Files folder

Name	Size	Type	Modified
HandDBase Installation Files		File Folder	6/4/2002 7:48 PM
NASA Center Databases		File Folder	6/4/2002 7:47 PM
NASA HanDBase Files		File Folder	6/5/2002 12:57 PM
Palm Desktop Installation Files		File Folder	6/5/2002 11:36 AM
DM Assessment Guide 10 June 02 for God...	313 KB	Microsoft Word Doc...	6/4/2002 2:34 PM
DM Assessment Guide 10 June Goddard A...	38 KB	Microsoft Word Doc...	6/4/2002 2:34 PM
DM Data Collection Setup & Operation.doc	245 KB	Microsoft Word Doc...	6/5/2002 7:25 PM

3. Double click on this folder and locate the files "setup_handbasepluspalm.exe" and "setup_handbaseplusppc.exe" as shown in Figure 10. If you have a Palm or a PDA using the Palm OS, run (double-click) on "setup_handbasepluspalm.exe." If you have a PocketPC (WindowsCE) PDA run "setup_handbaseplusppc.exe."

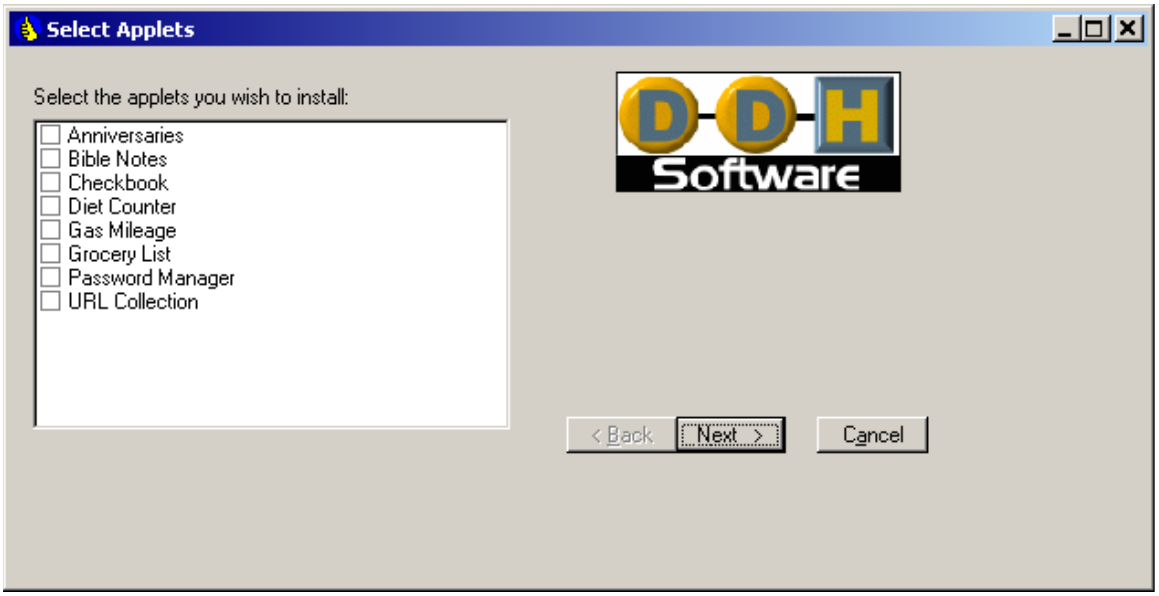
Figure 10: Locate appropriate setup file



4. Follow the on-screen prompts and choose the default options unless you wish to install HanDBase to a different location than "C:\Program Files\HanDBase".

5. When the HanDBase installation process reaches the point where you are asked to select applets to install to your PDA, uncheck all the boxes (if not already unchecked) as shown in and click [**Next**]. Finish the HanDBase desktop installation.

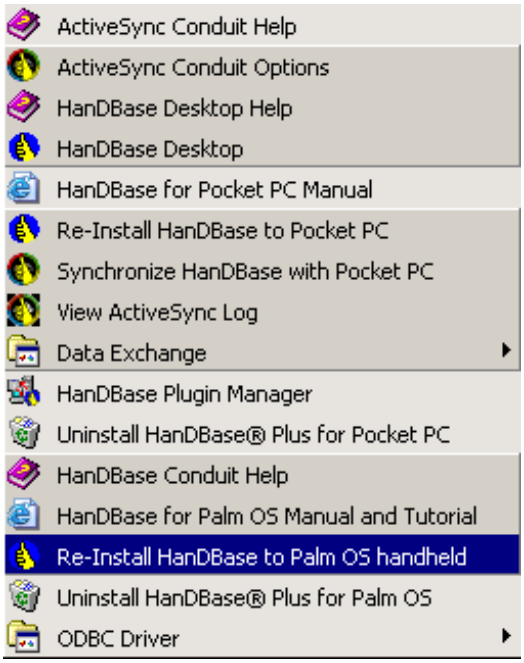
Figure 11: Finish Installation



6. After installing HanDBase to the desktop/laptop, the handheld portion of the HanDBase application must be installed on each assessment team's PDA.

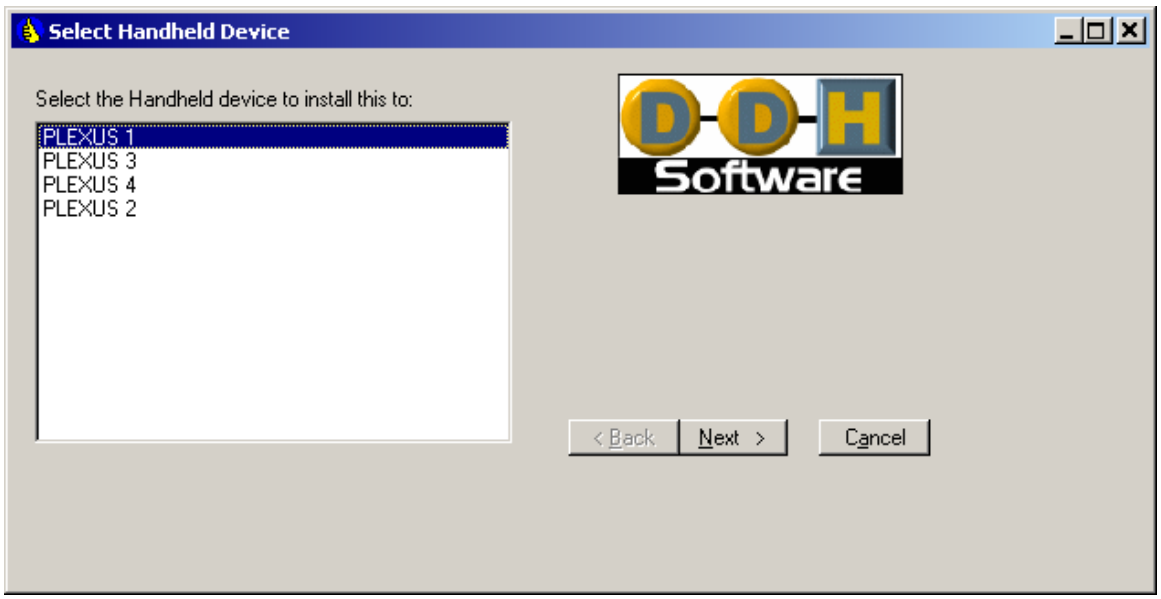
7. Menu select [**Start | Programs | HanDBase | Re-Install HanDBase to Palm OS handheld**]. The proper menu selection is shown in Figure 12.

Figure 12: Menu



8. A dialog prompting you to select the PDA to install HanDBase to will pop up as shown in Figure 13. Note that "PLEXUS 1" has been selected. Click the [**Next**] button.

Figure 13: Select PDA to install



9. The dialog shown in
10. Figure 14 will appear. Click [**OK**].

Figure 14: Install Dialog

11. Next, the dialog shown in Figure 15 will pop up. Click [**OK**] and the "Select Applets" dialog box will pop up. Click [**Cancel**].

Figure 15: Installing additional HandBase units

12. Repeat steps 7 thru 8 for each PDA.
13. Continue with Section 0,
14. Install NASA Center HanDBase Databases.

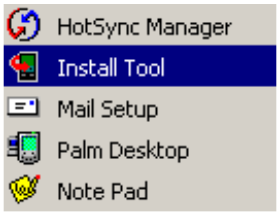
Install NASA Center HanDBase Databases

The goal of this section is to install two HanDBase databases onto each assessment team's PDA. The first database is titled "DM_COMMENTS.pdb". It contains pre-recorded comments that are typical assessment comments seen in the pilot deferred maintenance assessment at Marshall Space Flight Center (MSFC). The second database is the appropriate database for the NASA Center, Site or Installation (that is to be inspected) and the particular assessment team's PDA. There are multiple nearly identical databases for each NASA Center, the difference is that the names have an assessment team number appended (i.e. DM_GSFC_TEAM_1, DM_GSFC_TEAM_2, etc). For a discussion of how to choose the correct database, see Section 0,

NASA Facilities Hierarchy. For this example, the databases for the Goddard Space Flight Center (GSFC) and subordinate Sites/Installations will be installed to the appropriate assessment team's PDA.

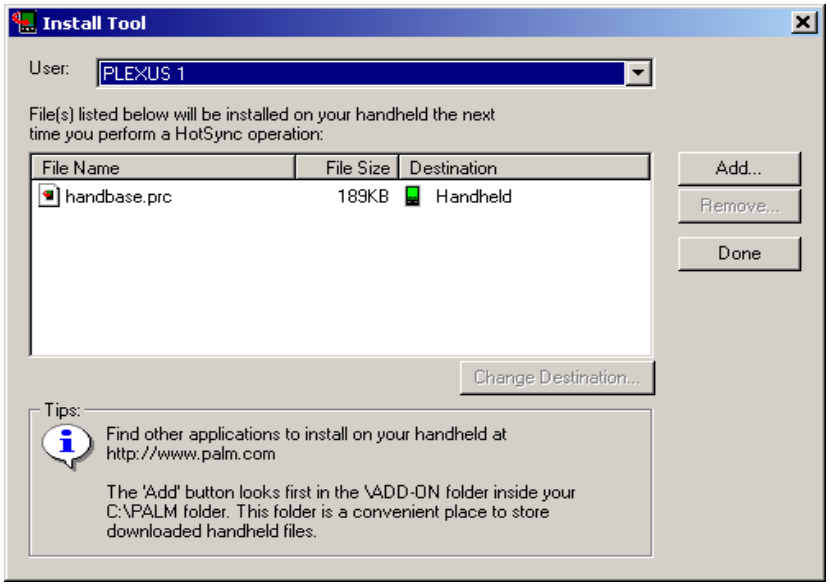
1. Menu select [**Start | Programs | Palm Desktop | Install Tool**] as shown in Figure 16.

Figure 16: Select "Install Tool"



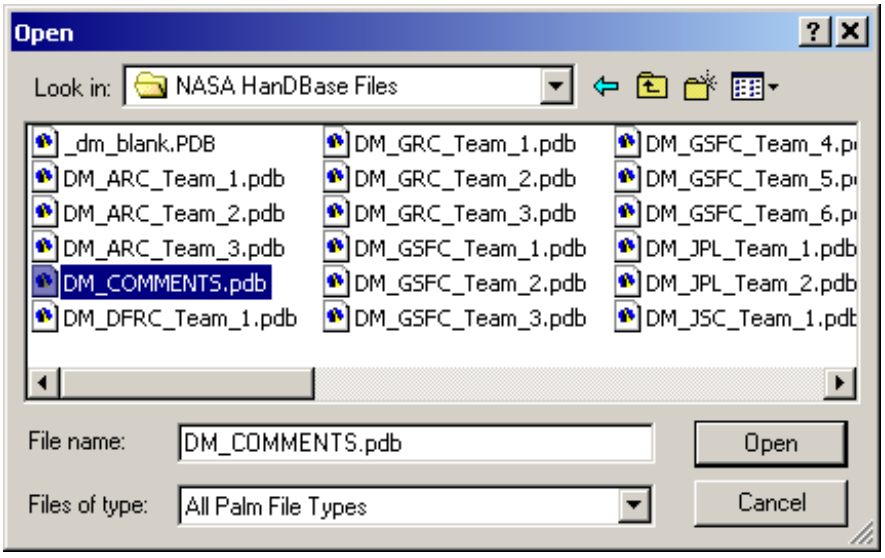
2. The resulting "Install Tool" dialog, shown in Figure 17, is used to select files and/or "Add-on" applications to a Palm PDA. Note the "handbase.prc" file already on the list of items to be installed on the "PLEXUS 1" PDA. This is the HanDBase PDA application that was "installed" to the "PLEXUS 1" PDA in steps 7 thru 8 of Section 0, **Installing HanDBase Desktop and PDA Applications.**

Figure 17: "Install Tool" dialog



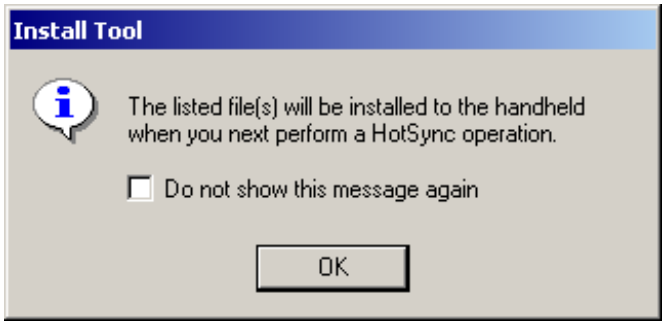
3. Next click the [**Add**] button on the "Install Tool" dialog. The standard Windows "Open" file dialog will pop up as shown in Figure 18. Using the dialog, navigate to the "NASA HanDBase Files" folder on the supplied CD. Select or highlight the "DM_COMMENTS.pdb" file (shown in Figure 18).

Figure 18: Select or highlight the "DM_COMMENTS.pdb" file



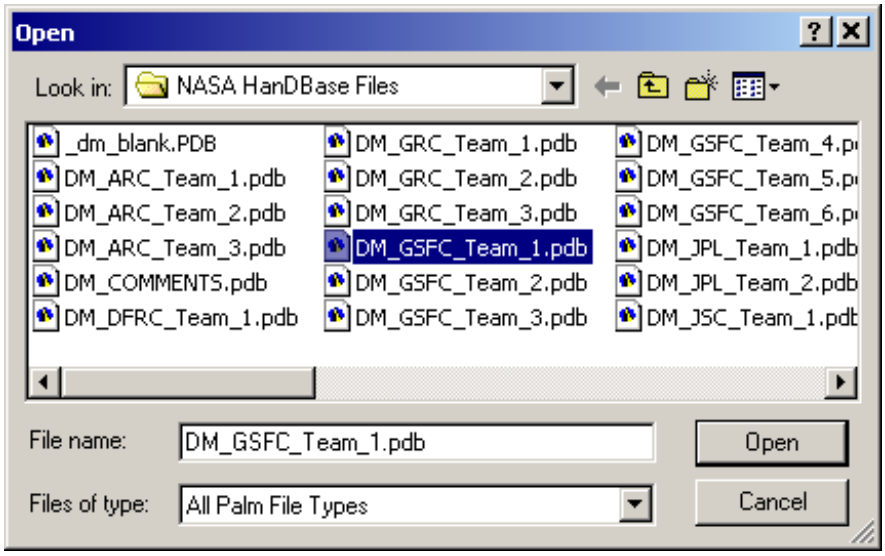
4. Click [**Open**] and the "DM_COMMENTS.pdb" file will be added to the list of the "Install Tool" dialog (Figure 17). Click [**OK**] to the resulting dialog shown in Figure 19.

Figure 19: Dialog Box



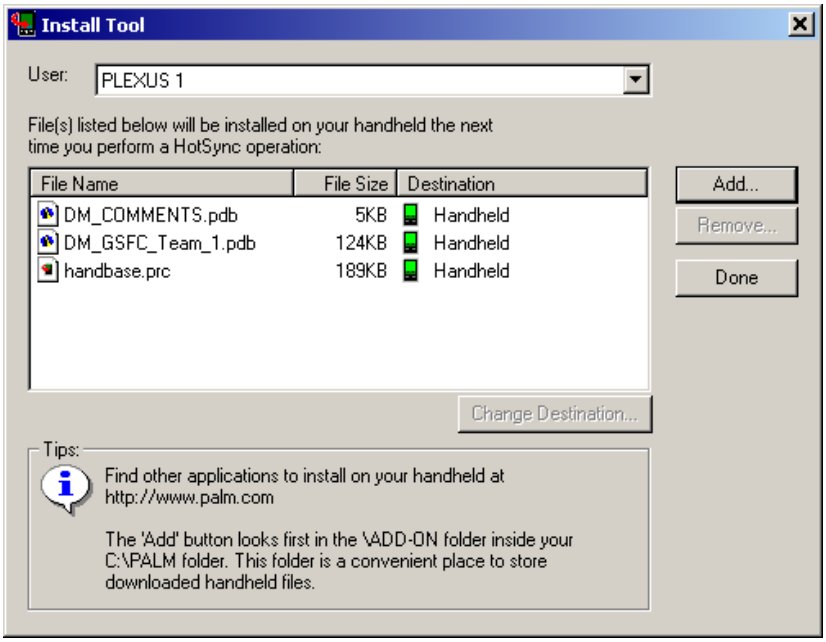
5. Repeat steps 3 and 4 but select the desired NASA Center/Team Database as shown in Figure 18, in this case the Goddard Space Flight Center database for assessment team number one ("DM_GSFC_TEAM_1").

Figure 20: Select or highlight additional files



6. The "Install Tool" files list should look like that shown in Figure 21.

Figure 21: The "Install Tool" files list



7. Select the next user on the "Install Tool" dialog using the "User:" drop down box at the top of the dialog. Repeat steps 3 thru 6 for each assessment team's PDA. When finished, click [**Done**] and [**OK**] to the resulting pop-up dialog.

8. Now, synchronize (HotSync) each team's PDA to install the HanDBase application and database files.

NASA Facilities Hierarchy

The NASA facility records in the Real Property Inventory (RPI) are arranged hierarchically by responsible NASA Centers. NASA basically has a three level hierarchy for its real property. In the absence of an approved NASA name for each "level" of the hierarchy, the following names and abbreviations were chosen:

- NASA Center (**CTR**): Topmost responsible NASA facility.
- NASA Site (**SITE**): A NASA facility that is subordinate to a NASA Center.
- NASA Installation (**INST**): A NASA facility that is subordinate to a NASA Site, that is in turn subordinate to a NASA Center.

Table details the NASA RPI hierarchy. HandDBase allows two levels of "filters". Since each NASA Center is in its own database, two levels of filters are sufficient to screen or "filter" each Center database for all existing combinations of **SITE** and **INST**. In other words, the two filters in HandDBase can be used to select only those records corresponding to the NASA facility that is being inspected. The table below is provided so that each inspector can determine the correct filter entries for the NASA facilities that they will be inspecting.

For instance, say one assessment team will be inspecting the Ames Research Center. Prior to starting their assessment, they would install the DM_ARC database on their Palm/PocketPC handheld. Then, to screen or "filter" out the records for Crows Landing, Camp Parks and Moffet Federal Airfield, the inspector would enter a dash (-) in each of the two filters in HandDBase. Then the HandDBase application would only show those records that have "ARC" for **CTR**, "-" for **SITE** and "-" for **INST**.

Similarly, if another assessment team was tasked with inspecting Moffet Federal Airfield, they would enter "ARC" for **CTR**, "MFA" for **SITE** and "-" for **INST**.

Note that the field **CTR** is not used in the filter since all the records in each database belong to one NASA Center.

ENT	CTR	SITE	INST	NAME
R	ARC	-	-	Ames Research Center
R	ARC	CL	-	Crows Landing
R	ARC	CP	-	Camp Parks
R	ARC	MFA	-	Moffet Federal Airfield
R	DFRC	-	-	Dryden Flight Research Center
R	GRC	-	-	Glenn Research Center
R	GRC	PBS	-	Plum Brook Station
Y	GSFC	-	-	Goddard Space Flight Center
Y	GSFC	BRT		Bilateral Ranging Transponder
Y	GSFC	BRT	A	Ascension Bilatering Ranging Transponder Fac
Y	GSFC	BRT	AS	American Samoa Bilateral Ranging Transponder Fac
Y	GSFC	MOBLAS		Mobile Laser Site
Y	GSFC	MOBLAS	BL	Bear Lake Mobile Laser Site
Y	GSFC	MOBLAS	B	Bermuda Mobile Laser Site
Y	GSFC	MOBLAS	EI	Easter Island Mobile Laser Site
Y	GSFC	MOBLAS	FD	Ft. Davis Mobile Laser Site
Y	GSFC	MOBLAS	HK	Hawaii Kauai Mobile Laser Site
Y	GSFC	MOBLAS	HM	Hawaii Maui Mobile Laser Site
Y	GSFC	MOBLAS	HAY	Haystack Mobile Laser Site
Y	GSFC	MOBLAS	K	Kwajalein Mobile Laser Site
Y	GSFC	MOBLAS	MP	Monument Peak Mobile Laser Site
Y	GSFC	MOBLAS	Oak	Oak Mountain Mobile Laser Site
Y	GSFC	MOBLAS	Otay	Otay Mountain Mobile Laser Site
Y	GSFC	MOBLAS	OV	Owens Valley Mobile Laser Site
Y	GSFC	MOBLAS	P	Platteville Mobile Laser Site
Y	GSFC	MOBLAS	Q	Quincy Mobile Laser Site
Y	GSFC	MOBLAS	T	Tahiti Mobile Laser Site
Y	GSFC	MOBLAS	Y	Yarragadee Mobile Laser Site
Y	GSFC	SMLF	-	Shiloh Microwave Link Facility
Y	GSFC	STDN		Spaceflight Tracking Data Network
Y	GSFC	STDN	-B	Bermuda Spaceflight Tracking/Data Network
Y	GSFC	STDN	-H	Hawaii Spaceflight Tracking/Data Network (STDN)
Y	GSFC	STDN	-P	Ponce De Leon Space Flight Tracking/Data Network (STDN)
Y	GSFC	STS		Space Transportation System
Y	GSFC	STS	Y	Yarragadee Space Transportation System Facility
Y	GSFC	VBLI		Verylong Baseline Interferometry
Y	GSFC	VBLI	CSL	Cabo San Lucas Verylong Baseline Interferometry Site
Y	GSFC	VBLI	CT	Cerro Tololo Verylong Baseline Interferometry Site
Y	GSFC	VBLI	E	Ensenada Verylong Baseline Interferometry Site
Y	GSFC	VBLI	I	Iquique Verylong Baseline Interferometry Site
Y	GSFC	VBLI	M	Mazatlan Verylong Baseline Interferometry Site
Y	GSFC	VBLI	PA	Point Arguello Verylong Baseline Interferometry Site
Y	GSFC	VBLI	S	Santiago Verylong Baseline Interferometry Site
Y	GSFC	VBLI	SI	Soccorro Island Verylong Baseline Interferometry
Y	GSFC	WFF	-	Wallops Flight Facility

Y	GSFC	WFF	NBF	National Balloon Facility, Palestine, TX
Y	GSFC	WFF	PFR	Poker Flats Research Range, Fairbanks, AK
S	JPL	-	-	Jet Propulsion Laboratory
S	JPL	TBLMTN	-	Table Mountain Observatory
S	JPL	DSN	-	Deep Space Network
S	JPL	DSN	CAN	Canberra Deep Space Communications Complex, Australia
S	JPL	DSN	GLDSTN	Goldstone, Deep Space Communications Complex ,CA
S	JPL	DSN	MAD	Madrid Deep Space Communications Complex, Spain
M	JSC	-	-	Johnson Space Center
M	JSC	ELLFLD	-	Ellington Field
M	JSC	PLMDALE	NASA	Palmdale, NASA Industrial Plant
M	JSC	PLMDALE	USAF	Palmdale, USAF Industrial Plant
M	JSC	WSTF	-	White Sands Test Facility
M	JSC	WSTF	SH	WSTF Space Harbor
M	JSC	WSTF	TDRSS1	White Sands 1st TDRSS
M	JSC	WSTF	TDRSS2	White Sands 2nd TDRSS
M	KSC	-	-	Kennedy Space Center
M	KSC	CCAFS	-	Cape Canaveral Air Force Station
M	KSC	TALS	-	Transoceanic Abort Landing Sites
M	KSC	TALS	MOR	Morocco
M	KSC	TALS	GAM	Gambia
R	LaRC	-	-	Langley Research Center
M	MSFC	-	-	Marshall Space Flight Center
M	MSFC	MAF	-	Michoud Assembly Facility
M	MSFC	SSFL	-	Santa Susanna Field Laboratory
M	MSFC	BCU		Brigham City, Utah
M	SSC	-	-	Stennis Space Center
M	SSC	SSCTEN	-	SSC Tenants

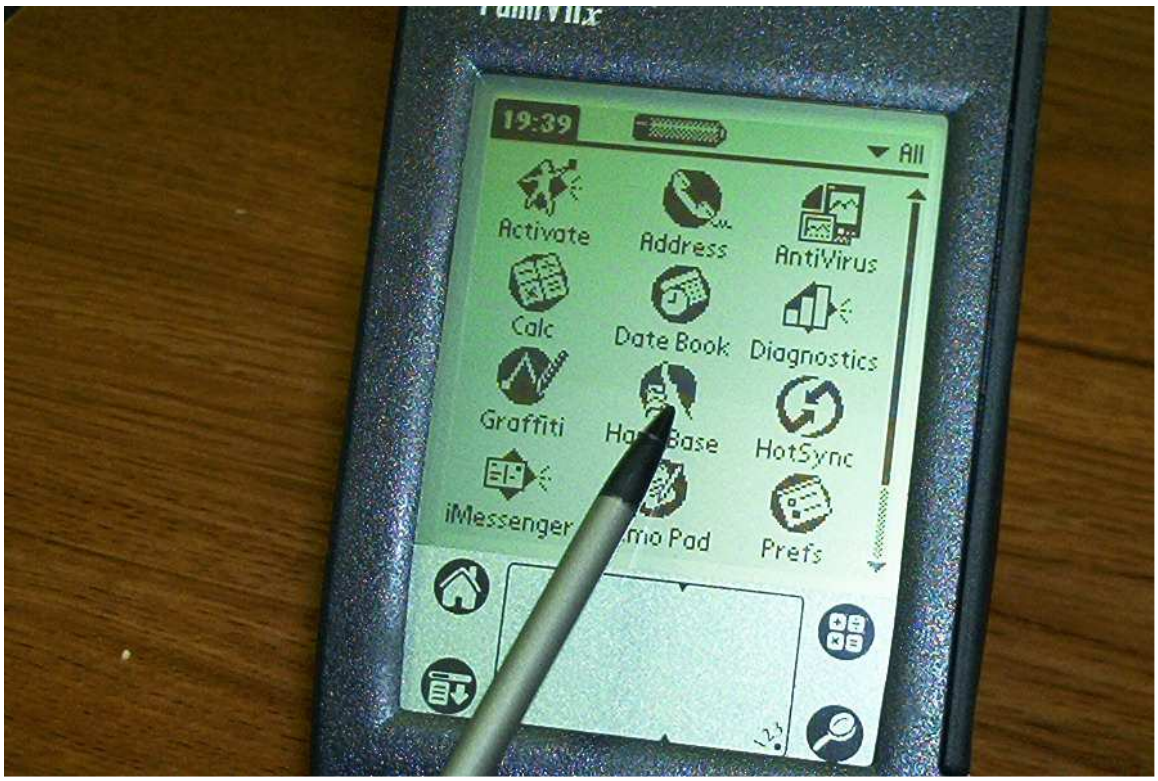
Table 8. NASA RPI Hierarchy

Using HanDBase with Palm OS

The goal of this section is to familiarize you with using HanDBase, filtering records in and entering data in the NASA facility databases.

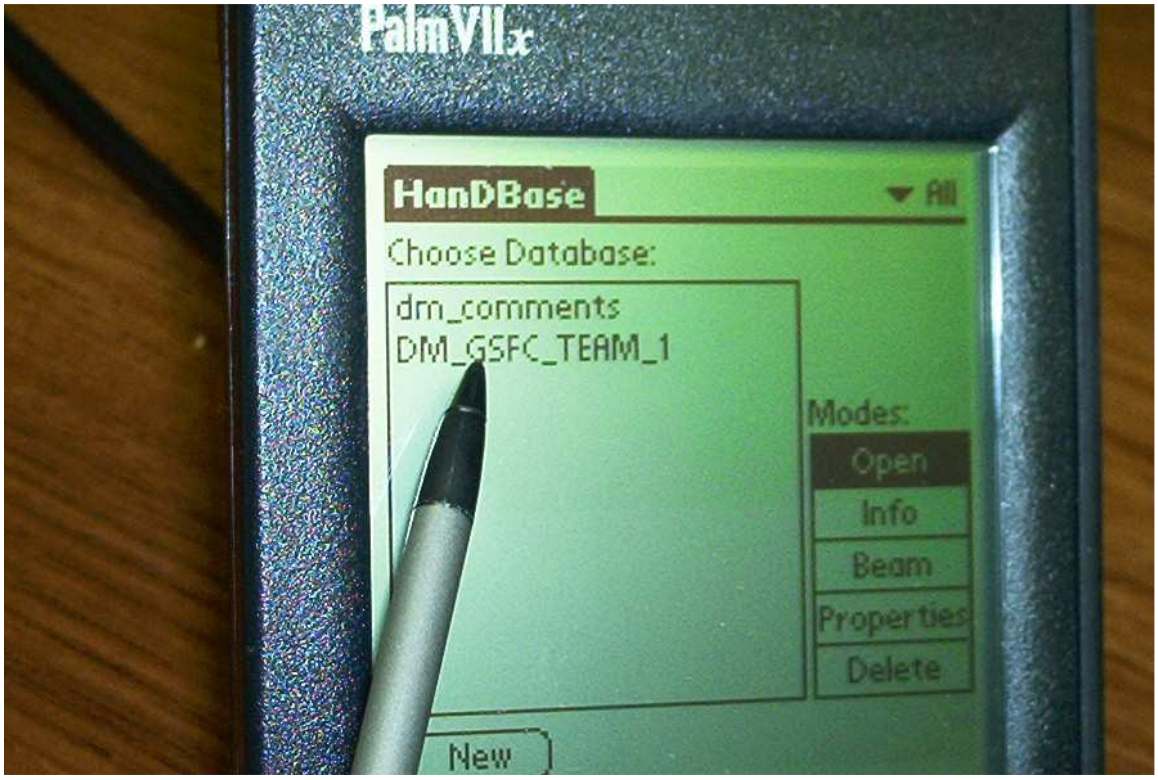
1. Turn on the Palm PDA and select the HanDBase icon as shown in Figure 22.

Figure 22: Select the HanDBase icon



2. HanDBase will start up and display the databases available for use. Make sure the **Open** choice under [**Modes:**] is highlighted and select "DM_GSFC_TEAM_1" (or applicable database for the NASA Center being inspected) as shown in Figure 23. Note that the "dm_comments" database is a supporting database. If there is a comment that an assessment team needs to use frequently that is not in the comments database, that comment can be added by adding a record to the "dm_comments" database. The comment will then be available for "automatic" entry into the comment fields of the NASA Center database.

Figure 23: Select "DM_GSFC_TEAM_1"



3. After opening the "DM_GSFC_TEAM_1" database, the Palm screen will look like that shown in Figure 24. Note the fields of interest, the facility or building number is [**FAC]**, the data the facility/building was originally constructed in under [**BUI**LT], the nine system categories are [**STR**UC], [**EXT**], [**RO**OF], [**HV**AC], [**ELEC**], [**PL**UMB], [**CON**V], [**INTF**] and [**EQU**IP].

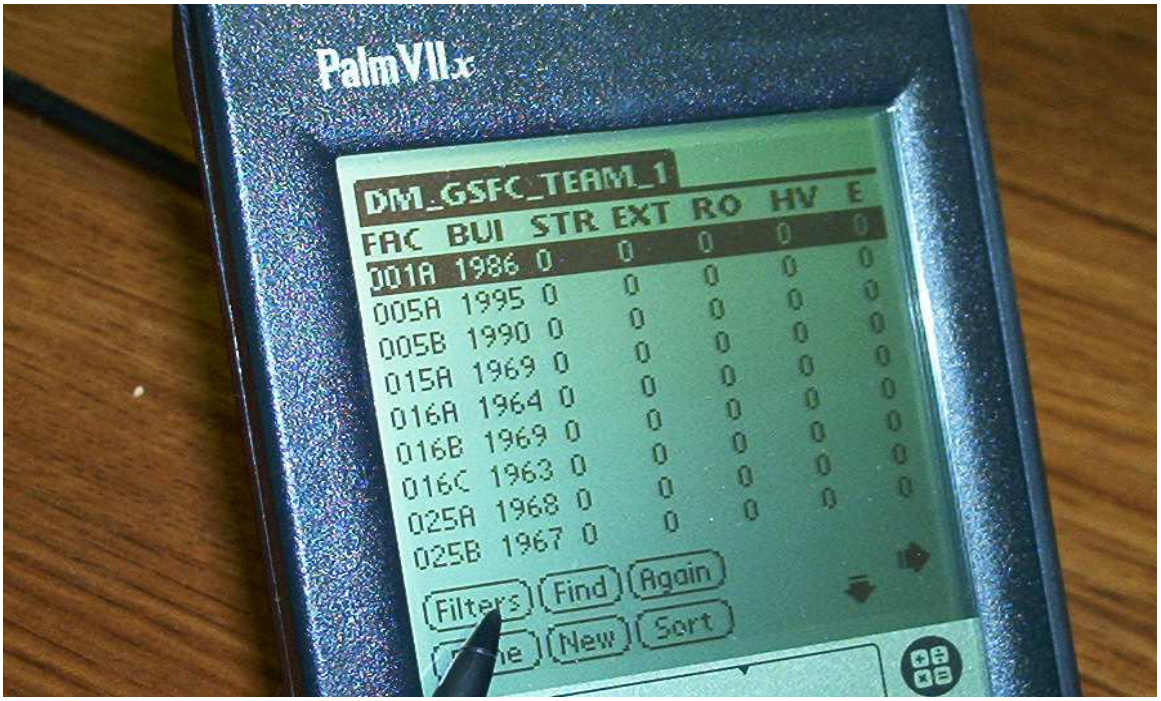
4. As detailed in the RPI hierarchy, this database contains the records for all GSFC and its subordinate facilities shown in Table . Assume that the assessment teams are inspecting Ponce De Leon Space Flight Tracking/Data Network (PSTDN). Only the records for PSTDN should be displayed, however, if a filter has not been applied all the records in the database will be displayed.

Table 9. Example RPI Hierarchy

GSFC	-	-	Goddard Space Flight Center
GSFC	HSTDN	-	Hawaii Space Flight Tracking/Data Network (STDN)
GSFC	PSTDN	-	Ponce De Leon Space Flight Tracking/Data Network (STDN)
GSFC	SMLF	-	Shiloh Microwave Link Facility
GSFC	WFF	-	Wallops Flight Facility
GSFC	WFF	NBF	National Balloon Facility, Palestine, TX
GSFC	WFF	PFR	Poker Flats Research, Fairbanks, AK

5. To set up a filter, tap the [**Filters**] button shown under the stylus in Figure 24.

Figure 24: After opening the "DM_GSFC_TEAM_1" database



6. An **Edit Filters** screen appears as shown in Figure 25. Tap on the checkbox for **Filter 1** as shown in the figure.

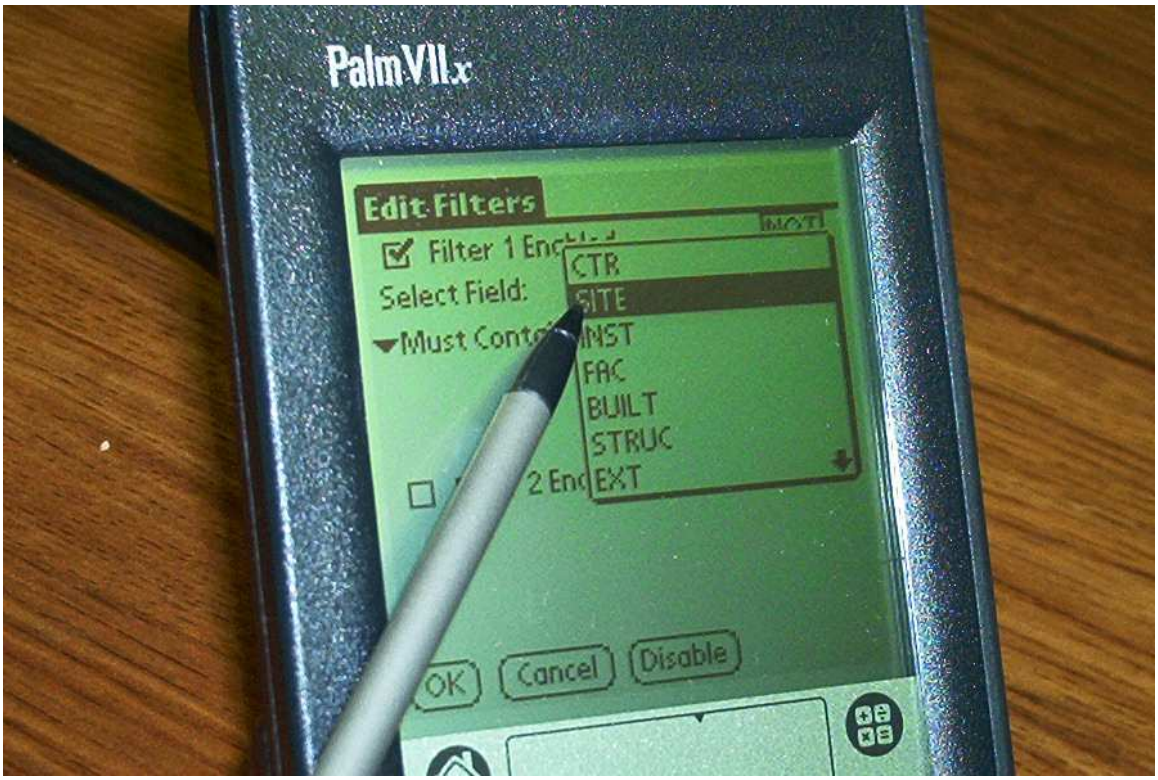
Figure 25: Edit Filters screen

7. Tapping on the checkbox for **Filter 1** enables the filter and the **Select Field:** drop down (defaulted to **CTR**) as shown in Figure 26. Tap on the drop down arrow to the left of **CTR**.

Figure 26: Tap on the drop down arrow to the left of CTR

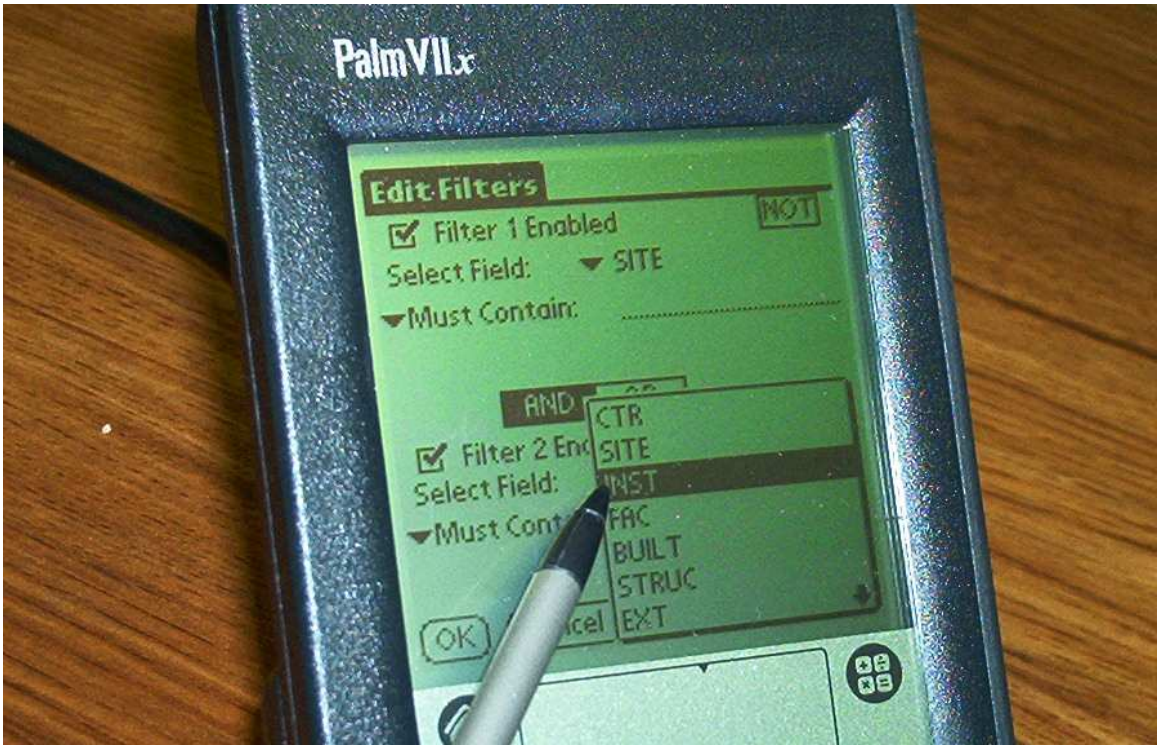
8. Select the **SITE** choice from the resulting menu as shown in Figure 27. Next enable **Filter 2** by tapping its checkbox.

Figure 27: Select the SITE choice



9. Select the INST choice from the menu for Filter 2 as shown in Figure 28.

Figure 28: Select INST from menu

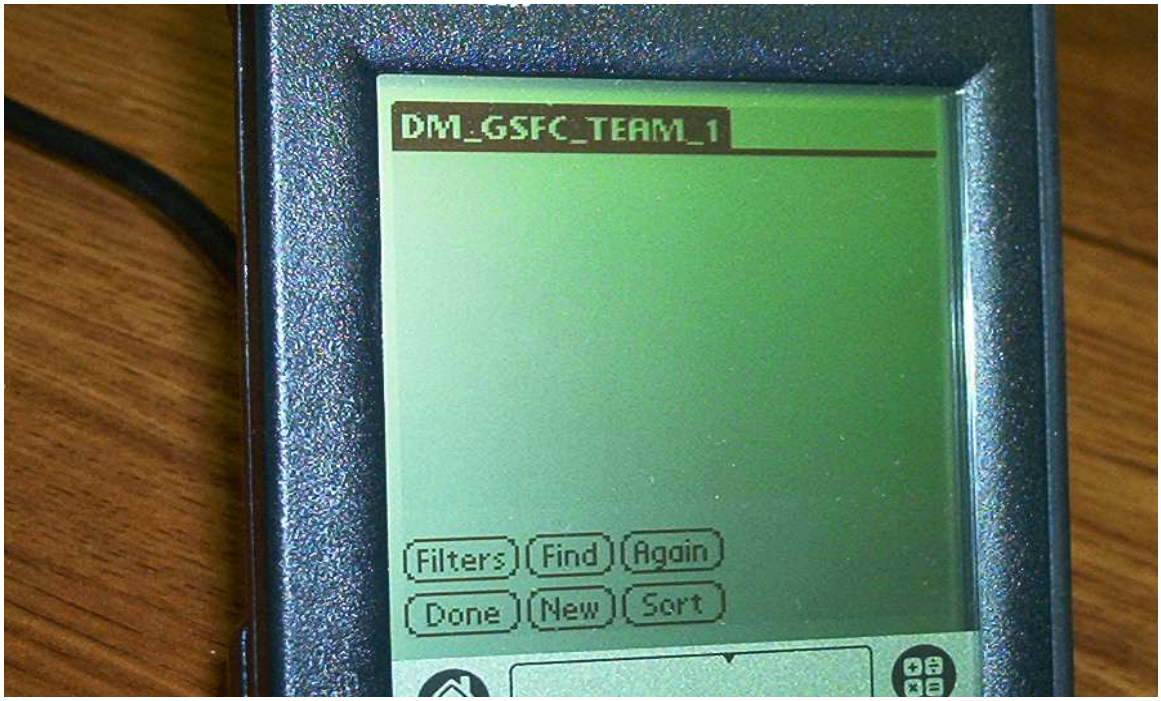


10. Enable Filter by Checking Box

Figure 29: Enable Filter

11. Choose Team

Figure 30: Highlight and choose team



12. Highlight Facility and Open Record

Figure 31a: Highlight Facility

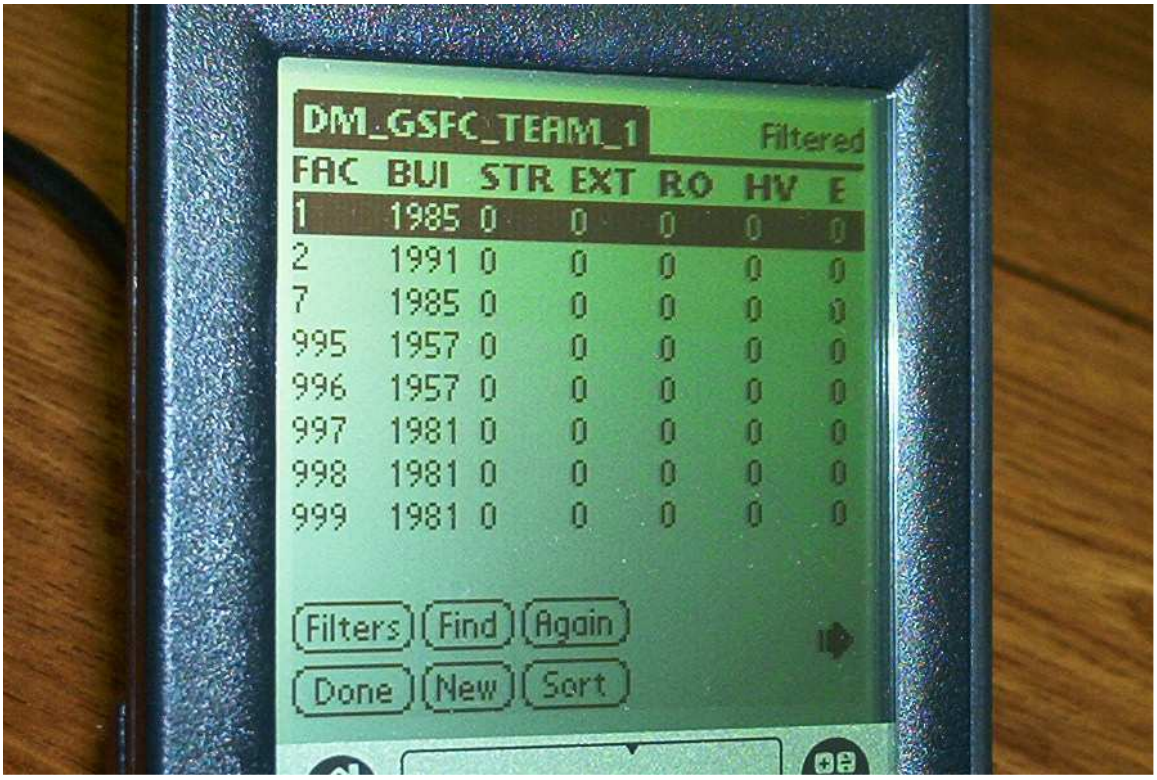
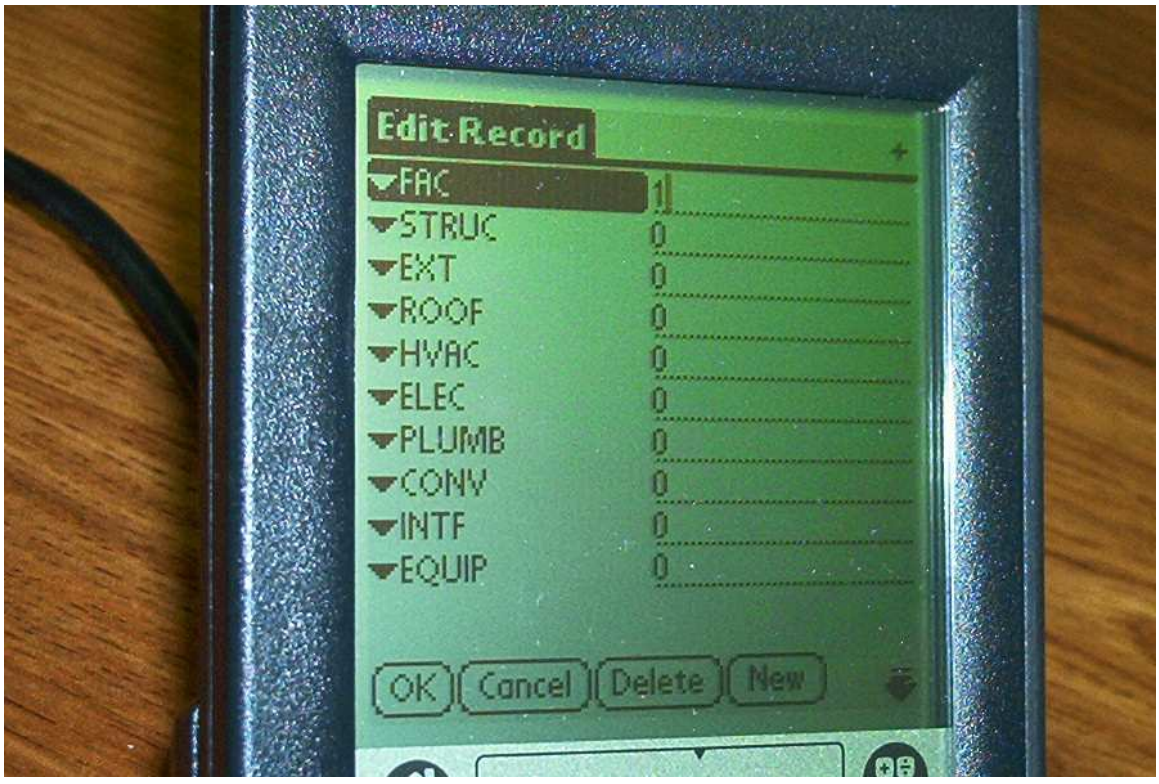


Figure 31b: Facility drop down menu



13. Rate System by Drop Down Window

Figure 32a: Highlight system

Figure 32b: Rating popup list

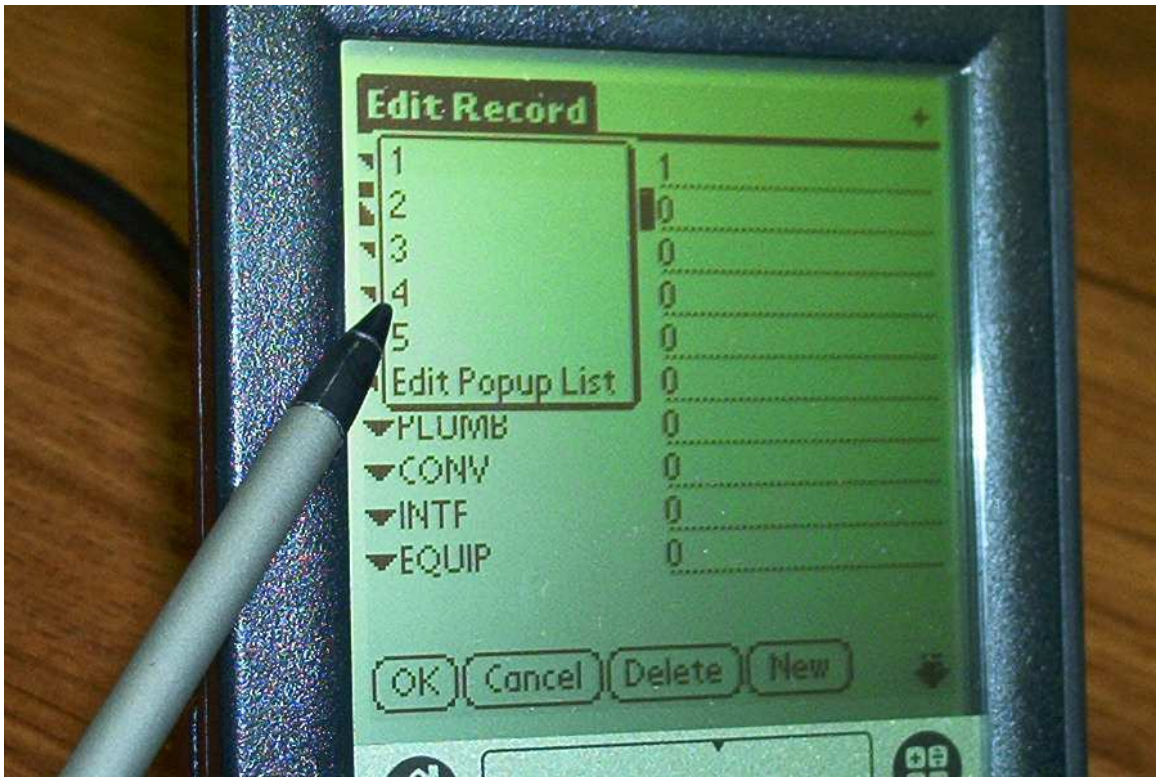
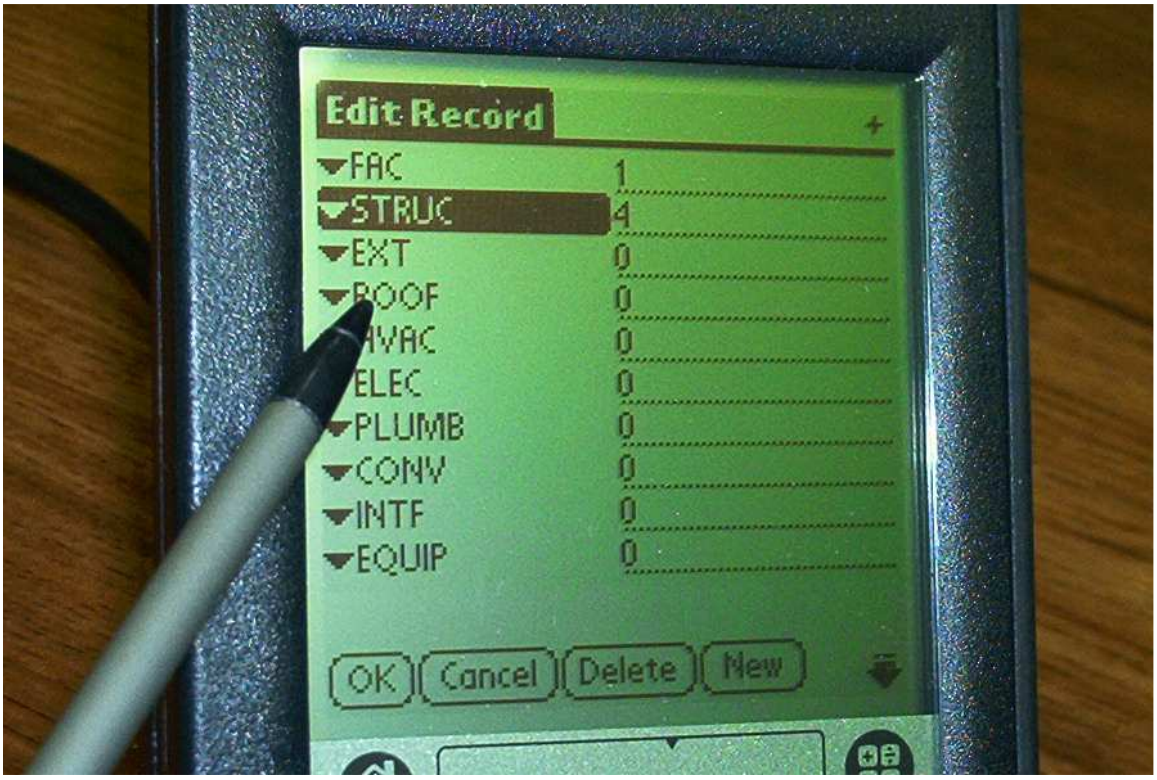


Figure 32c: Rate system



14.Select Appropriate Comments From DM Comment Database

Figure 33a: Choose comments

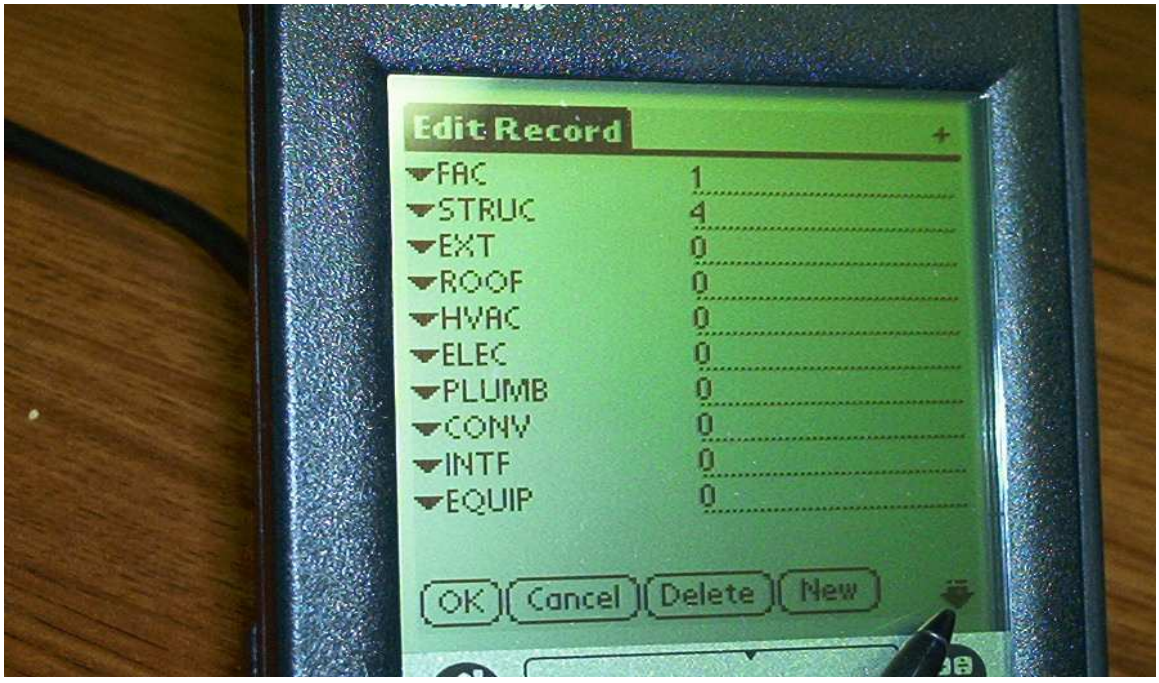


Figure 33b: Select System

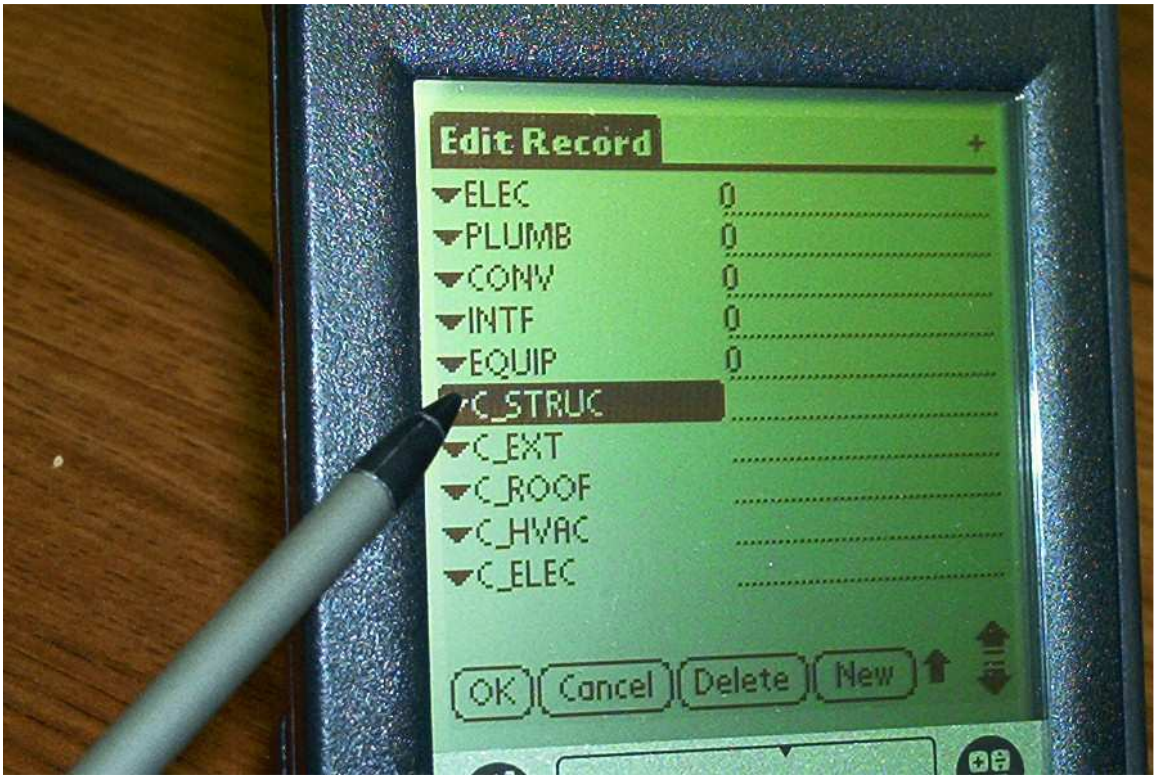


Figure 33c: Select comment

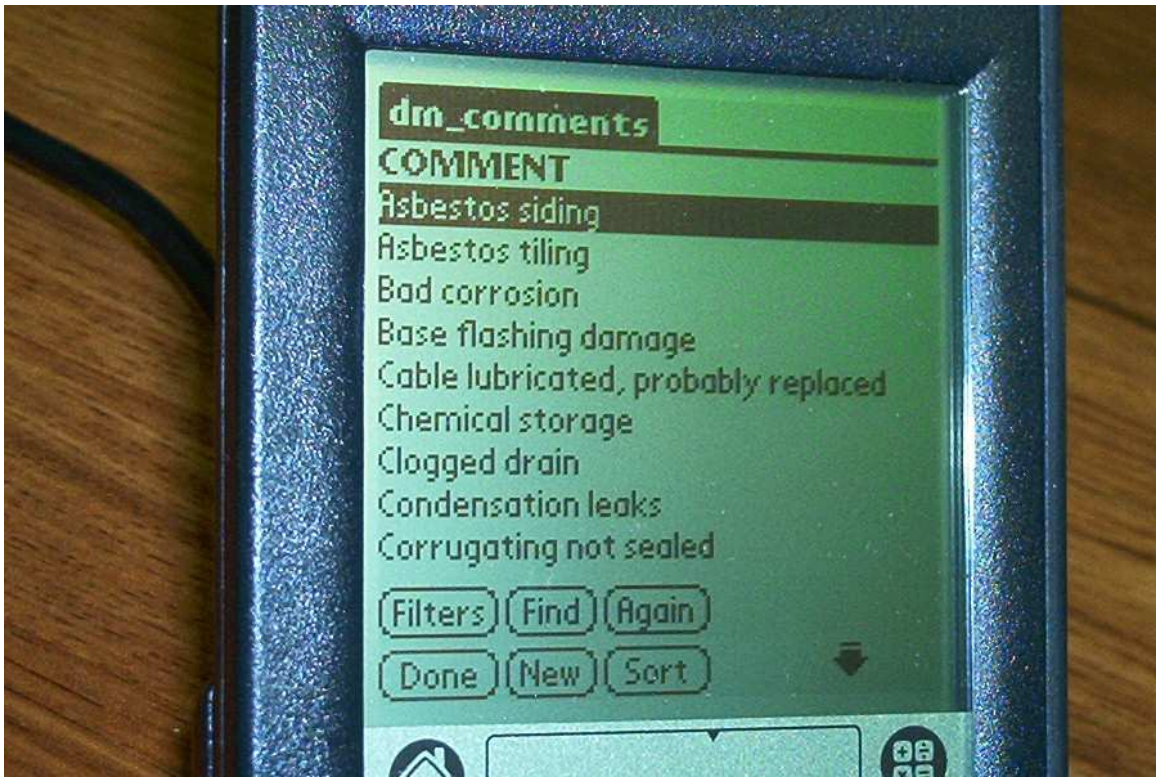


Figure 33d: Close facility

Figure 33e. Enter OK

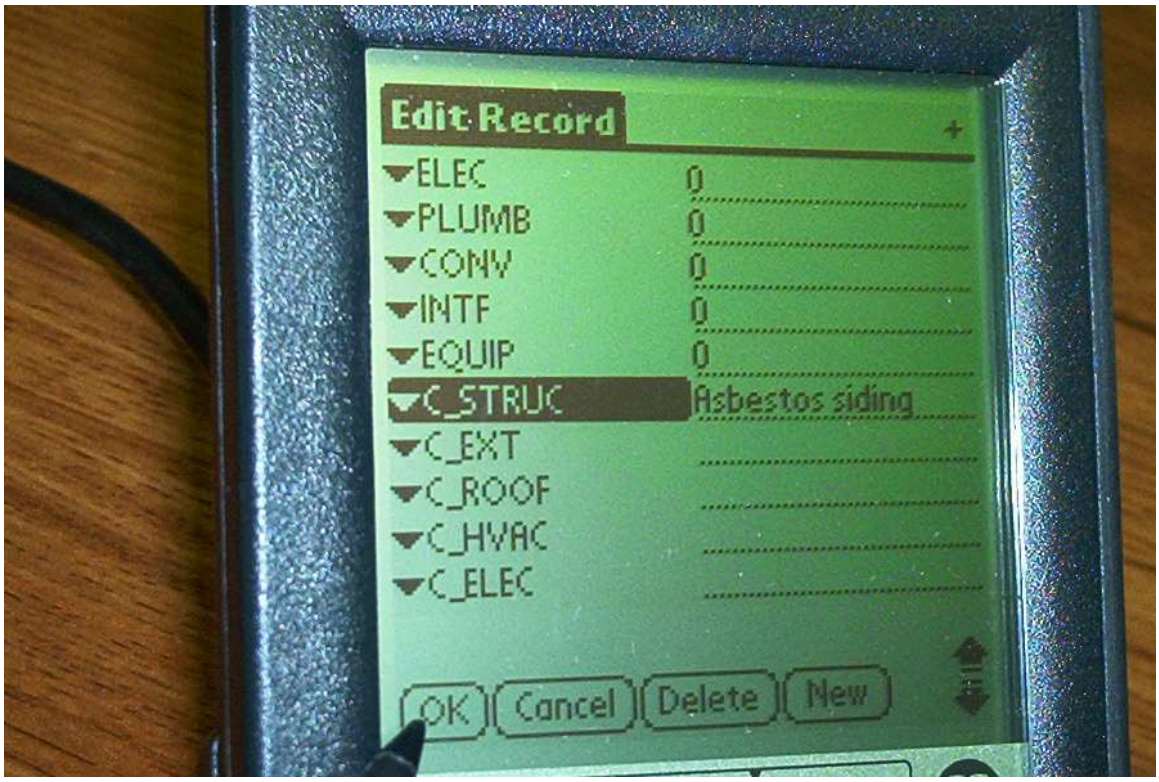


Figure 34. Finished record

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Appendix C. Database Table and Query Explanations

Table C-1. Object Purpose Table

Object Type	Object Name	Query Effect	Object Purpose
Table	CODES_COMMENT	NA	List of comments from assessment teams, for use in automating future data collection efforts.
Table	CODES_NASA_CTR	NA	This table replicates the hierarchy of the NASA Centers, Sites and Installations as found in the RPI.
Table	CODES_NASA_DM_CAT	NA	NASA Class codes and the associated description.
Table	FACILITIES	NA	The main table that contains various data on each facility (from the RPI), the assessment ratings, assessment comments and more.
Table	Field Documentation	NA	This table documents the fields in the tables and queries in this database.
Table	Object Documentation	NA	This table documents the various objects (tables, queries, forms, reports, etc.) in this database.
Table	PERC_CRV_COND	NA	This table contains the percentage assigned to each of the nine systems by assessment rating level.
Table	PERC_SYS_CRV	NA	This table contains the percentage assigned to each system by DM Category Code.
Query	dev_Create Excel View with CALCULATIONS ver 1	Select Query, does not modify tables or data.	This query creates a view or spreadsheet that is copied and then pasted into a preformated Excel spreadsheet. The Excel spreadsheet performs most of the calculations to derive the DM value and FCI for each facility, Installation, Site and Center. There
Query	dev_Create Excel View with CALCULATIONS ver 2	Select Query, does not modify tables or data.	This query creates a view or spreadsheet that is copied and then pasted into a preformated Excel spreadsheet. The Excel spreadsheet performs most of the calculations to derive the DM value and FCI for each facility, Installation, Site and Center. There

Object Type	Object Name	Query Effect	Object Purpose
Query	dev_DM by DM_CAT_CODE	Select Query, does not modify tables or data.	This query sums the Deferred Maintenance for each DM Category Agency Wide.
Query	dev_Multiple RPI Issues	Select Query, does not modify tables or data.	This query creates a view of all facilities with two or more RPI issues.
Query	prod_DM Calculation	Select Query, does not modify tables or data.	This query creates a view of the DM values for all facilities by System.
Query	prod_DOD CRV Calculation View	Select Query, does not modify tables or data.	This query creates a view of each facilities CRV calculated by the DOD method. The DOD CRV for all NASA facilities could not be calculated due to "Unit of Issue" inconsistencies and other data problems.
Query	prod_DOD CRV Delta Calculation	Select Query, does not modify tables or data.	This query creates a view of the difference (DELTA) between the DOD CRV and the NASA CRV for each facility and ranks the facilities by the Delta, descending.
Query	prod_Flat File View	Select Query, does not modify tables or data.	This query creates a "flat file" view of the data from the FACILITIES table along with the DM and FCI calculations
Query	prod_Update FACILTIES DM and FCI Values	Update Query, modifies values in tables.	This query updates the FAC_DM and FCI values in the FACILITIES table.

Table C-2. Field Document 1

Parent Object	Field Name	Key Field	Required	Allow Nulls	Index	Data Type	Size	Foreign Key	Foreign Key Object	Field Description	Field Source	Total	Sort	Criteria
CODES_CAT_BLDG														
	DM_CAT_CODE	TRUE	FALSE	FALSE	TRUE	Number	Single			DM Category Code Number				
	NASA_BLDG	FALSE	FALSE	FALSE	FALSE	Text	255			Description of buildings or facilities with this DM Category Code				
CODES_COMMENT														
	COMMENT	TRUE	FALSE	FALSE	TRUE	Text	255			Frequently used comments from DM inspections				
CODES_NASA_CTR														
	CTR	TRUE	FALSE	FALSE	FALSE	Text	5			Text code to identify the NASA Center				
	SITE	TRUE	FALSE	FALSE	TRUE	Text	7			Text code to identify the NASA Site				
	INST	TRUE	FALSE	FALSE	FALSE	Text	7			Text code to identify the NASA Installation				
	NAME	FALSE	FALSE	FALSE	FALSE	Text	100			Name of the NASA location				
	BMAR2001	FALSE	FALSE	FALSE	FALSE	Currency				2001 BMAR value for the NASA location				
CODES_NASA_DM_CAT														
	NASA_CAT_CODES	TRUE	FALSE	FALSE	TRUE	Text	7			NASA Category Code from the RPI				
	DM_CAT_CODE	FALSE	FALSE	FALSE	TRUE	Single		DM_CAT_CODE	CODES_CAT_BLDG	DM Category Code associated with this NASA Category Code				
	DESC	FALSE	FALSE	FALSE	FALSE					NASA Category Code description				
dev_Create Excel View with CALCULATIONS ver 1														
	CTR	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	SITE	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	INST	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	FAC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	DESC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	STAT	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CRV	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	EXCL_YR	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	PERC_EXCL	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CAPACITY	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	BUILT	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	DM_CAT_CODE	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CLASS	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	STRUC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			

Parent Object	Field Name	Key Field	Required	Allow Nulls	Index	Data Type	Size	Foreign Key	Foreign Key Object	Field Description	Field Source	Total	Sort	Criteria
	CorrectedPerc	FALSE	FALSE	FALSE	FALSE					The system percentage assigned to the Structure system, corrected for other systems that might have an inspection rating of ZERO (meaning that system didn't exist for that facility)	Calculated			
	STRUC_PercCond	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the inspection condition from the PERC_CRV_COND table.	Calculated			
	STRUC_DM	FALSE	FALSE	FALSE	FALSE					The calculated Structure DM value for the building/facility	Calculated			
	ROOF	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	ROOF_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculated			
	ROOF_PercCond	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the inspection condition from the PERC_CRV_COND table.	Calculated			
	ROOF_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	EXT	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	EXT_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculated			
	EXT_PercCOND	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the inspection condition from the PERC_CRV_COND table.	Calculated			
	EXT_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	INTF	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	INTF_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculated			
	INTF_PercCond	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the inspection condition from the PERC_CRV_COND table.	Calculated			
	INTF_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	ELEC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	ELEC_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculated			
	ELEC_PercCond	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the inspection condition from the PERC_CRV_COND table.	Calculated			
	ELEC_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	HVAC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	HVAC_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculated			
	HVAC_PercCond	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the inspection condition from the PERC_CRV_COND table.	Calculated			
	HVAC_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	PLUMB	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	PLUMB_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculated			
	PLUMB_PercCond	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the inspection condition from the PERC_CRV_COND table.	Calculated			
	PLUMB_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	CONV	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CONV_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculated			
	CONV_PercCond	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the inspection condition from the PERC_CRV_COND table.	Calculated			

Parent Object	Field Name	Key Field	Required	Allow Nulls	Index	Data Type	Size	Foreign Key	Foreign Key Object	Field Description	Field Source	Total	Sort	Criteria
	CONV_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	EQUIP	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	EQUIP_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculated			
	EQUIP_PercCond	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the inspection condition from the PERC_CRV_COND table.	Calculated			
	EQUIP_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	Facility_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the building/facility.	Calculated			
	FCI	FALSE	FALSE	FALSE	FALSE					Calculates the FCI for the building/facility.	Calculated			
dev_Create Excel View with CALCULATIONS ver 2														
	CTR	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	SITE	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	INST	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	FAC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	DESC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	STAT	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CRV	FALSE	FALSE	FALSE	FALSE					Although this is a calculated field, the only purpose is to check if the CRV value is NULL, and if it is return a ZERO, otherwise return the CRV value.	Calculation			
	EXCL_YR	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	PERC_EXCL	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CAPACITY	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	BUILT	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	DM_CAT_CODE	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CLASS	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	STRUC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CorrectedPerc	FALSE	FALSE	FALSE	FALSE					Calculates a corrected system percentage for the STRUC system by adding the percentages of systems that have a zero rating (for that building/facility) to the STRUC system percentage.	Calculation			
	ROOF	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	ROOF_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculation			
	EXT	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	EXT_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculation			
	INTF	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	INTF_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculation			
	ELEC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			

Parent Object	Field Name	Key Field	Required	Allow Nulls	Index	Data Type	Size	Foreign Key	Foreign Key Object	Field Description	Field Source	Total	Sort	Criteria
	ELEC_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculation			
	HVAC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	HVAC_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculation			
	PLUMB	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	PLUMB_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculation			
	CONV	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CONV_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculation			
	EQUIP	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	EQUIP_PercSys	FALSE	FALSE	FALSE	FALSE					Selects the percentage for the system for the DM Category Code from the PERC_SYS_CRV table.	Calculation			
	FCI	FALSE	FALSE	FALSE	FALSE					Calculates the FCI for the building/facility.	Calculation			
dev_DM by DM_CAT_CODE														
	DM_CAT_CODE	FALSE	FALSE	FALSE	FALSE					This field is part of an MS Access "Totals" calculation and in this instance the records in the FACILITIES table are grouped by their DM Category Code.	FACILITIES	Group By	Ascending	
	FAC_DM	FALSE	FALSE	FALSE	FALSE					This field is part of an MS Access "Totals" calculation. The DM values in this field are summed according to the "Group By" field.	Calculation	Sum		
FACILITIES														
	CTR	TRUE	FALSE	FALSE	TRUE	Text	5	CODES_NASA_CTR	CTR	Code to record the Center to which the facility belongs				
	SITE	TRUE	FALSE	FALSE	TRUE	Text	7	CODES_NASA_CTR	SITE	Code to record the Site to which the facility belongs				
	INST	TRUE	FALSE	FALSE	TRUE	Text	7	CODES_NASA_CTR	INST	Code to record the Installation to which the facility belongs				
	FAC	TRUE	FALSE	FALSE	TRUE	Text	15			Building or Facility number				
	STRUC	FALSE	FALSE	FALSE	FALSE	Long Integer				The Structure DM Inspection rating				
	ROOF	FALSE	FALSE	FALSE	FALSE	Long Integer				The Roof DM Inspection rating				
	EXT	FALSE	FALSE	FALSE	FALSE	Long Integer				The Roof DM Inspection rating				
	INTF	FALSE	FALSE	FALSE	FALSE	Long Integer				The Roof DM Inspection rating				
	ELEC	FALSE	FALSE	FALSE	FALSE	Long Integer				The Roof DM Inspection rating				
	HVAC	FALSE	FALSE	FALSE	FALSE	Long Integer				The Roof DM Inspection rating				
	PLUMB	FALSE	FALSE	FALSE	FALSE	Long Integer				The Roof DM Inspection rating				
	CONV	FALSE	FALSE	FALSE	FALSE	Long Integer				The Roof DM Inspection rating				
	EQUIP	FALSE	FALSE	FALSE	FALSE	Long Integer				The Roof DM Inspection rating				
	FAC_DM	FALSE	FALSE	FALSE	FALSE	Currency				The calculated DM value for the building/facility				
	FCI	FALSE	FALSE	FALSE	FALSE	Single				The calculated Facility Condition Index (FCI) value for the building/facility				

Parent Object	Field Name	Key Field	Required	Allow Nulls	Index	Data Type	Size	Foreign Key	Foreign Key Object	Field Description	Field Source	Total	Sort	Criteria
	C_FAC	FALSE	FALSE	FALSE	FALSE	Text	255			Inspection comments pertaining to the entire building/facility				
	C_STRUC	FALSE	FALSE	FALSE	FALSE	Text	255			Inspection comments pertaining to the building/facility's Structure				
	C_ROOF	FALSE	FALSE	FALSE	FALSE	Text	255			Inspection comments pertaining to the entire building/facility's Roof				
	C_EXT	FALSE	FALSE	FALSE	FALSE	Text	255			Inspection comments pertaining to the entire building/facility's Exterior				
	C_INTF	FALSE	FALSE	FALSE	FALSE	Text	255			Inspection comments pertaining to the entire building/facility's Interior Finishes				
	C_ELEC	FALSE	FALSE	FALSE	FALSE	Text	255			Inspection comments pertaining to the entire building/facility's Electrical				
	C_HVAC	FALSE	FALSE	FALSE	FALSE	Text	255			Inspection comments pertaining to the entire building/facility's HVAC equipment				
	C_PLUMB	FALSE	FALSE	FALSE	FALSE	Text	255			Inspection comments pertaining to the entire building/facility's Plumbing				
	C_CONV	FALSE	FALSE	FALSE	FALSE	Text	255			Inspection comments pertaining to the entire building/facility's Conveyances				
	C_EQUIP	FALSE	FALSE	FALSE	FALSE	Text	255			Inspection comments pertaining to the entire building/facility's Collateral Equipment				
	DESC	FALSE	FALSE	FALSE	FALSE	Text	255			Building/facility description from the RPI				
	STAT	FALSE	FALSE	FALSE	FALSE	Text	15			Building/facility Status from the RPI				
	CRV	FALSE	FALSE	FALSE	FALSE	Currency				Building/facility Current Replacement Value (CRV) from the RPI				
	EXCL_YR	FALSE	FALSE	FALSE	FALSE	Integer				Building/facility Exclusion Year from the RPI				
	PERC_EXCL	FALSE	FALSE	FALSE	FALSE	Single				The percent to exclude from the building/facilitiy CRV				
	CAPACITY	FALSE	FALSE	FALSE	FALSE	Text	50			Building/facility capacity (i.e. square feet) from the RPI				
	BUILT	FALSE	FALSE	FALSE	FALSE	Text	4			The year the building/facility was initially built/commissioned from the RPI				
	DM_CAT_CODE	FALSE	FALSE	FALSE	FALSE	Single				The DM Category Code number assigned to the building/facility				
	CLASS	FALSE	FALSE	FALSE	FALSE	Text	10	NASA_CAT_CODES	CODES_NASA_DM_CAT	The building/facility NASA Class code from the RPI				
	SYS_ID	FALSE	FALSE	FALSE	TRUE	Integer				The building/facility NASA System ID from the RPI				
	BOOK_VAL	FALSE	FALSE	FALSE	FALSE	Currency				The building/facility Book Value from the RPI				
	INSP	FALSE	FALSE	FALSE	FALSE	Date/Time				The date and time this inspection of the building/facility was conducted				
	NotInRPI	FALSE	FALSE	FALSE	FALSE	Yes/No				Checked if the building/facility was not in the RPI data download and thus had to be added manually to the database				
	DM_CAT_ORIGINAL	FALSE	FALSE	FALSE	FALSE	Single				The original DM Category Code (some codes get changed to better fit the system percentage breakdown)				
	DM_CAT_FIX	FALSE	FALSE	FALSE	FALSE	Single				The DM Category Code that the building/facilitiy was switched to				
Field Documentation														
	ParentObject	FALSE	FALSE	FALSE	FALSE	Text	100	ObjectName	Object Documentation	Name of the object that contains the documented field				
	ParentType	FALSE	FALSE	FALSE	FALSE	Text	50			The type of object of the parent of the field				
	FldName	FALSE	FALSE	FALSE	FALSE	Text	50			The name of the documented field				

Parent Object	Field Name	Key Field	Required	Allow Nulls	Index	Data Type	Size	Foreign Key	Foreign Key Object	Field Description	Field Source	Total	Sort	Criteria
	FldOrder	FALSE	FALSE	FALSE	FALSE	Integer				The order that the documented field appears in the parent object				
	Key	FALSE	FALSE	FALSE	FALSE	Yes/No				Checked if the field is a key field				
	Reqd	FALSE	FALSE	FALSE	FALSE	Yes/No				Checked if the field is required to contain data				
	AllowNull	FALSE	FALSE	FALSE	FALSE	Yes/No				Checked if the field is allowed to contain a NULL value				
	Index	FALSE	FALSE	FALSE	FALSE	Yes/No				Checked if the field is indexed				
	DataType	FALSE	FALSE	FALSE	FALSE	Text	12			The data type of the documented field				
	Size	FALSE	FALSE	FALSE	FALSE	Text	50			The size of the field if applicable				
	ForeignKey	FALSE	FALSE	FALSE	TRUE	Text	50			The name of the foreign key field if applicable				
	ForeignKeyObject	FALSE	FALSE	FALSE	FALSE	Text	100			The name of the parent object of the foreign key field if applicable				
	FldDescription	FALSE	FALSE	FALSE	FALSE	Memo				A description of the documented field				
	FldSource	FALSE	FALSE	FALSE	FALSE	Text	100			The name of the query or table that is the source for the field (applies to fields from query objects only)				
	CalcFldString	FALSE	FALSE	FALSE	FALSE	Memo				The text string from the equation builder of the calculation (applies to fields from query objects only)				
	FldSort	FALSE	FALSE	FALSE	FALSE	Text	10			The sort order (ascending, descending) of the field if any (applies to fields from query objects only)				
	FldCriteria	FALSE	FALSE	FALSE	FALSE	Text	255			The filter or selection criteria for this field in the query (applies to fields from query objects only)				
Object Documentation														
	ObjectType	TRUE	FALSE	FALSE	FALSE	Text	50			The type (Table, Query, Form, Report etc) of the documented object				
	ObjectName	TRUE	FALSE	FALSE	FALSE	Text	100			The name of the documented object				
	QueryEffect	FALSE	FALSE	FALSE	FALSE	Text	50			The effect (Select, Make Table, Update etc) of the query if the object is a query				
	ObjectPurpose	FALSE	FALSE	FALSE	FALSE	Memo				A description of the purpose of the documented object				
	QuerySQL	FALSE	FALSE	FALSE	FALSE	Memo				The actual SQL of the query if the documented object is a query				
PERC_CRV_COND														
	Order	FALSE	FALSE	FALSE	FALSE	Byte				The sort order for the systems shown in the PERC_CRV_COND table				
	SYSTEM	TRUE	FALSE	FALSE	TRUE	Text	255			The name of the system				
	CR5	FALSE	FALSE	FALSE	FALSE	Single				The percentage assigned to the system with a condition rating of 5				
	CR4	FALSE	FALSE	FALSE	FALSE	Single				The percentage assigned to the system with a condition rating of 4				
	CR3	FALSE	FALSE	FALSE	FALSE	Single				The percentage assigned to the system with a condition rating of 3				
	CR2	FALSE	FALSE	FALSE	FALSE	Single				The percentage assigned to the system with a condition rating of 2				
	CR1	FALSE	FALSE	FALSE	FALSE	Single				The percentage assigned to the system with a condition rating of 1				
	CR0	FALSE	FALSE	FALSE	FALSE	Single				Placeholder for Systems that have not been inspected, prevents erroneous calculations				

Parent Object	Field Name	Key Field	Required	Allow Nulls	Index	Data Type	Size	Foreign Key	Foreign Key Object	Field Description	Field Source	Total	Sort	Criteria
PERC_SYS_CRV														
	DM_CAT_CODE	TRUE	FALSE	FALSE	TRUE	Single		DM_CAT_CODE	CODES_CAT_BLDG	The DM Category Code				
	DESC	FALSE	FALSE	FALSE	FALSE	Text	255			A description of the DM Category (duplicated information)				
	STRUC	FALSE	FALSE	FALSE	FALSE	Double				Percentage of CRV that STRUCTURE is assigned for the particular DM_CAT_CODE				
	ROOF	FALSE	FALSE	FALSE	FALSE	Double				Percentage of CRV that ROOF is assigned for the particular DM_CAT_CODE				
	EXT	FALSE	FALSE	FALSE	FALSE	Double				Percentage of CRV that EXTERIOR is assigned for the particular DM_CAT_CODE				
	INTF	FALSE	FALSE	FALSE	FALSE	Double				Percentage of CRV that INTERIOR is assigned for the particular DM_CAT_CODE				
	ELEC	FALSE	FALSE	FALSE	FALSE	Double				Percentage of CRV that ELECTRICAL is assigned for the particular DM_CAT_CODE				
	HVAC	FALSE	FALSE	FALSE	FALSE	Double				Percentage of CRV that HVAC is assigned for the particular DM_CAT_CODE				
	PLUMB	FALSE	FALSE	FALSE	FALSE	Double				Percentage of CRV that PLUMBING is assigned for the particular DM_CAT_CODE				
	CONV	FALSE	FALSE	FALSE	FALSE	Double				Percentage of CRV that CONVEYANCE is assigned for the particular DM_CAT_CODE				
	EQUIP	FALSE	FALSE	FALSE	FALSE	Double				Percentage of CRV that EQUIPMENT is assigned for the particular DM_CAT_CODE				
prod_DM Calculation														
	CTR	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	SITE	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	INST	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	FAC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	CorrectedPerc	FALSE	FALSE	FALSE	FALSE					Calculates a corrected system percentage for the STRUC system by adding the percentages of systems that have a zero rating (for that building/facility) to the STRUC system percentage.	Calculation			
	STRUC_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculation			
	ROOF_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculation			
	EXT_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculation			
	INTF_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculation			
	ELEC_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculation			
	HVAC_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculation			
	PLUMB_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculation			
	CONV_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculation			
	EQUIP_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculation			
	Facility_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the building/facility.	Calculation			
	FCI	FALSE	FALSE	FALSE	FALSE					Calculates the FCI for the building/facility.	Calculation			

Parent Object	Field Name	Key Field	Required	Allow Nulls	Index	Data Type	Size	Foreign Key	Foreign Key Object	Field Description	Field Source	Total	Sort	Criteria
	IntermediateFCICalc	FALSE	FALSE	FALSE	FALSE					Calculates the contribution for the building/facility to the weighted FCI. The calculation is an "intermediate" calculation since these contributions must be summed to obtain the weighted FCI.	Calculation			
prod_Flat File View														
	CTR	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	SITE	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	INST	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	FAC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES		Ascending	
	DESC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	STAT	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CRV	FALSE	FALSE	FALSE	FALSE					Although this is a calculated field, the only purpose is to check if the CRV value is NULL, and if it is return a ZERO, otherwise return the CRV value.	Calculation			
	EXCL_YR	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	PERC_EXCL	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CAPACITY	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	BUILT	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	DM_CAT_CODE	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CLASS	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	STRUC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CorrectedPerc	FALSE	FALSE	FALSE	FALSE					Calculates a corrected system percentage for the STRUC system by adding the percentages of systems that have a zero rating (for that building/facility) to the STRUC system percentage.	Calculation			
	STRUC_DM	FALSE	FALSE	FALSE	FALSE					The calculated Structure DM value for the building/facility	Calculated			
	ROOF	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	ROOF_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	EXT	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	EXT_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	INTF	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	INTF_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	ELEC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	ELEC_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	HVAC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	HVAC_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	PLUMB	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			

Parent Object	Field Name	Key Field	Required	Allow Nulls	Index	Data Type	Size	Foreign Key	Foreign Key Object	Field Description	Field Source	Total	Sort	Criteria
	PLUMB_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	CONV	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	CONV_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	EQUIP	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	EQUIP_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the system.	Calculated			
	Facility_DM	FALSE	FALSE	FALSE	FALSE					Calculates the the DM value for the building/facility.	Calculated			
	FCI	FALSE	FALSE	FALSE	FALSE					Calculates the FCI for the building/facility.	Calculated			
	C_FAC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	C_STRUC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	C_ROOF	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	C_EXT	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	C_INTF	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	C_ELEC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	C_HVAC	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	C_PLUMB	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	C_CONV	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
	C_EQUIP	FALSE	FALSE	FALSE	FALSE					See FACILITIES table documentation	FACILITIES			
prod_Update FACILTIES DM and FCI Values														
	FAC_DM	FALSE	FALSE	FALSE	FALSE					This field calculates the building/facility DM value and updates the FAC_DM field in the FACILITIES table.	Calculated			
	FCI	FALSE	FALSE	FALSE	FALSE					This field calculates the building/facility FCI value and updates the FCI field in the FACILITIES table.	Calculated			

Table C-3. Field Document 2

Parent Object	Field Name	Calculated Field String
CODES_CAT_BLDG		
	DM_CAT_CODE	
	NASA_BLDG	
	CODES_COMMENT	
	COMMENT	
CODES_NASA_CTR		
	CTR	
	SITE	
	INST	
	NAME	
	BMAR2001	
CODES_NASA_DM_CAT		
	NASA_CAT_CODES	
	DM_CAT_CODE	
	DESC	
dev_Create Excel View with CALCULATIONS ver 1		
	CTR	
	SITE	
	INST	
	FAC	
	DESC	
	STAT	
	CRV	
	EXCL_YR	
	PERC_EXCL	
	CAPACITY	
	BUILT	
	DM_CAT_CODE	
	CLASS	
	STRUC	
	CorrectedPerc	CorrectedPerc: [PERC_SYS_CRV]![STRUC]+IIf([FACILITIES]![ROOF]=0 And [PERC_SYS_CRV]![ROOF]<>0,[PERC_SYS_CRV]![ROOF],0)+IIf([FACILITIES]![EXT]=0 And [PERC_SYS_CRV]![EXT]<>0,[PERC_SYS_CRV]![EXT],0)+IIf([FACILITIES]![INTF]=0 And [PERC_SYS_CRV]![INTF]<>0,[PERC
	STRUC_PercCond	STRUC_PercCond: Choose([FACILITIES]![STRUC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR3]","[PERC_CRV_COND]","[SYSTEM]='ST
	STRUC_DM	STRUC_DM: [CorrectedPerc]*[FACILITIES]![CRV]*(Choose([FACILITIES]![STRUC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR3]","

Parent Object	Field Name	Calculated Field String
	ROOF	
	ROOF_PercSys	ROOF_PercSys: [PERC_SYS_CRV]![ROOF]
	ROOF_PercCond	ROOF_PercCond: Choose([FACILITIES]![ROOF]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR3]","[PERC_CRV_COND]","[SYSTEM]='ROOF'")
	ROOF_DM	ROOF_DM: [PERC_SYS_CRV]![ROOF]*[FACILITIES]![CRV]*(Choose([FACILITIES]![ROOF]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR3]",
	EXT	
	EXT_PercSys	EXT_PercSys: [PERC_SYS_CRV]![EXT]
	EXT_PercCOND	EXT_PercCond: Choose([FACILITIES]![EXT]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR3]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLook
	EXT_DM	EXT_DM: [PERC_SYS_CRV]![EXT]*[FACILITIES]![CRV]*(Choose([FACILITIES]![EXT]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR3]","[PERC
	INTF	
	INTF_PercSys	INTF_PercSys: [PERC_SYS_CRV]![INTF]
	INTF_PercCond	INTF_PercCond: Choose([FACILITIES]![INTF]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR3]","[PERC_CRV_COND]","[SYSTEM]='INTF'")
	INTF_DM	INTF_DM: [PERC_SYS_CRV]![INTF]*[FACILITIES]![CRV]*(Choose([FACILITIES]![INTF]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR3]",
	ELEC	
	ELEC_PercSys	ELEC_PercSys: [PERC_SYS_CRV]![ELEC]
	ELEC_PercCond	ELEC_PercCond: Choose([FACILITIES]![ELEC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR3]","[PERC_CRV_COND]","[SYSTEM]='ELEC'")
	ELEC_DM	ELEC_DM: [PERC_SYS_CRV]![ELEC]*[FACILITIES]![CRV]*(Choose([FACILITIES]![ELEC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR3]",
	HVAC	
	HVAC_PercSys	HVAC_PercSys: [PERC_SYS_CRV]![HVAC]
	HVAC_PercCond	HVAC_PercCond: Choose([FACILITIES]![HVAC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR3]","[PERC_CRV_COND]","[SYSTEM]='HVAC'")
	HVAC_DM	HVAC_DM: [PERC_SYS_CRV]![HVAC]*[FACILITIES]![CRV]*(Choose([FACILITIES]![HVAC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR3]",
	PLUMB	
	PLUMB_PercSys	PLUMB_PercSys: [PERC_SYS_CRV]![PLUMB]
	PLUMB_PercCond	PLUMB_PercCond: Choose([FACILITIES]![PLUMB]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[CR3]","[PERC_CRV_COND]","[SYSTEM]='PL

Parent Object	Field Name	Calculated Field String
	PLUMB_DM	PLUMB_DM: [PERC_SYS_CRV]![PLUMB]*[FACILITIES]![CRV]*(Choose([FACILITIES]![PLUMB]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[
	CONV	
	CONV_PercSys	CONV_PercSys: [PERC_SYS_CRV]![CONV]
	CONV_PercCond	CONV_PercCond: Choose([FACILITIES]![CONV]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR3]","[PERC_CRV_COND]","[SYSTEM]='CONV'")
	CONV_DM	CONV_DM: [PERC_SYS_CRV]![CONV]*[FACILITIES]![CRV]*(Choose([FACILITIES]![CONV]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR3]",
	EQUIP	
	EQUIP_PercSys	EQUIP_PercSys: [PERC_SYS_CRV]![EQUIP]
	EQUIP_PercCond	EQUIP_PercCond: Choose([FACILITIES]![EQUIP]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[CR3]","[PERC_CRV_COND]","[SYSTEM]='EQ
	EQUIP_DM	EQUIP_DM: [PERC_SYS_CRV]![EQUIP]*[FACILITIES]![CRV]*(Choose([FACILITIES]![EQUIP]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[
	Facility_DM	Facility_DM: [STRUC_DM]+[EXT_DM]+[ROOF_DM]+[HVAC_DM]+[ELEC_DM]+[PLUMB_DM]+[CONV_DM]+[INTF_DM]+[EQUIP_DM]
	FCI	FCI: [CorrectedPerc]*[FACILITIES]![STRUC]+[PERC_SYS_CRV]![EXT]*[FACILITIES]![EXT]+[PERC_SYS_CRV]![ROOF]*[FACILITIES]![ROOF]+[PERC_SYS_CRV]![HVAC]*[FACILITIES]![HVAC]+[PERC_SYS_CRV]![ELEC]*[FACILITIES]![ELEC]+[PERC_SYS_CRV]![PLUMB]*[FACILITIES]![PLUMB]+[PE
dev_Create Excel View with CALCULATIONS ver 2		
	CTR	
	SITE	
	INST	
	FAC	
	DESC	
	STAT	
	CRV	CRV: IIf([FACILITIES]![CRV] Is Null,0,[FACILITIES]![CRV])
	EXCL_YR	
	PERC_EXCL	
	CAPACITY	
	BUILT	
	DM_CAT_CODE	
	CLASS	
	STRUC	
	CorrectedPerc	CorrectedPerc: [PERC_SYS_CRV]![STRUC]+IIf([FACILITIES]![ROOF]=0 And [PERC_SYS_CRV]![ROOF]<>0,[PERC_SYS_CRV]![ROOF],0)+IIf([FACILITIES]![EXT]=0 And [PERC_SYS_CRV]![EXT]<>0,[PERC_SYS_CRV]![EXT],0)+IIf([FACILITIES]![INTF]=0 And [PERC_SYS_CRV]![INTF]<>0,[PERC
	ROOF	
	ROOF_PercSys	ROOF_PercSys: [PERC_SYS_CRV]![ROOF]
	EXT	
	EXT_PercSys	EXT_PercSys: [PERC_SYS_CRV]![EXT]

Parent Object	Field Name	Calculated Field String
	INTF	
	INTF_PercSys	INTF_PercSys: [PERC_SYS_CRV]![INTF]
	ELEC	
	ELEC_PercSys	ELEC_PercSys: [PERC_SYS_CRV]![ELEC]
	HVAC	
	HVAC_PercSys	HVAC_PercSys: [PERC_SYS_CRV]![HVAC]
	PLUMB	
	PLUMB_PercSys	PLUMB_PercSys: [PERC_SYS_CRV]![PLUMB]
	CONV	
	CONV_PercSys	CONV_PercSys: [PERC_SYS_CRV]![CONV]
	EQUIP	
	EQUIP_PercSys	EQUIP_PercSys: [PERC_SYS_CRV]![EQUIP]
	FCI	FCI: [CorrectedPerc]*[FACILITIES]![STRUC]+[PERC_SYS_CRV]![EXT]*[FACILITIES]![EXT]+[PERC_SYS_CRV]![ROOF]*[FACILITIES]![ROOF]+[PERC_SYS_CRV]![HVAC]*[FACILITIES]![HVAC]+[PERC_SYS_CRV]![ELEC]*[FACILITIES]![ELEC]+[PERC_SYS_CRV]![PLUMB]*[FACILITIES]![PLUMB]+[PE
dev_DM by DM_CAT_CODE		
	DM_CAT_CODE	
	FAC_DM	MS Access Totals Calc
FACILITIES		
	CTR	
	SITE	
	INST	
	FAC	
	STRUC	
	ROOF	
	EXT	
	INTF	
	ELEC	
	HVAC	
	PLUMB	
	CONV	
	EQUIP	
	FAC_DM	
	FCI	
	C_FAC	
	C_STRUC	
	C_ROOF	
	C_EXT	
	C_INTF	
	C_ELEC	
	C_HVAC	
	C_PLUMB	
	C_CONV	

Parent Object	Field Name	Calculated Field String
	C_EQUIP	
	DESC	
	STAT	
	CRV	
	EXCL_YR	
	PERC_EXCL	
	CAPACITY	
	BUILT	
	DM_CAT_CODE	
	CLASS	
	SYS_ID	
	BOOK_VAL	
	INSP	
	NotInRPI	
	DM_CAT_ORIGINAL	
	DM_CAT_FIX	
Field Documentation		
	ParentObject	
	ParentType	
	FldName	
	FldOrder	
	Key	
	Reqd	
	AllowNull	
	Index	
	DataType	
	Size	
	ForeignKey	
	ForeignKeyObject	
	FldDescription	
	FldSource	
	CalcFldString	
	FldSort	
	FldCriteria	
Object Documentation		
	ObjectType	
	ObjectName	
	QueryEffect	
	ObjectPurpose	
	QuerySQL	
PERC_CRV_COND		
	Order	
	SYSTEM	

Parent Object	Field Name	Calculated Field String
	CR5	
	CR4	
	CR3	
	CR2	
	CR1	
	CR0	
PERC_SYS_CRV		
	DM_CAT_CODE	
	DESC	
	STRUC	
	ROOF	
	EXT	
	INTF	
	ELEC	
	HVAC	
	PLUMB	
	CONV	
	EQUIP	
prod_DM Calculation		
	CTR	
	SITE	
	INST	
	FAC	
	CorrectedPerc	CorrectedPerc: [PERC_SYS_CRV]![STRUC]+IIf([FACILITIES]![ROOF]=0 And [PERC_SYS_CRV]![ROOF]<>0,[PERC_SYS_CRV]![ROOF],0)+IIf([FACILITIES]![EXT]=0 And [PERC_SYS_CRV]![EXT]<>0,[PERC_SYS_CRV]![EXT],0)+IIf([FACILITIES]![INTF]=0 And [PERC_SYS_CRV]![INTF]<>0,[PERC
	STRUC_DM	STRUC_DM: [CorrectedPerc]*[FACILITIES]![CRV]*(Choose([FACILITIES]![STRUC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR3]",""
	ROOF_DM	EXT_DM: [PERC_SYS_CRV]![EXT]*[FACILITIES]![CRV]*(Choose([FACILITIES]![EXT]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR3]","[PERC
	EXT_DM	ROOF_DM: [PERC_SYS_CRV]![ROOF]*[FACILITIES]![CRV]*(Choose([FACILITIES]![ROOF]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR3]",
	INTF_DM	INTF_DM: [PERC_SYS_CRV]![INTF]*[FACILITIES]![CRV]*(Choose([FACILITIES]![INTF]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR3]",
	ELEC_DM	ELEC_DM: [PERC_SYS_CRV]![ELEC]*[FACILITIES]![CRV]*(Choose([FACILITIES]![ELEC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR3]",
	HVAC_DM	HVAC_DM: [PERC_SYS_CRV]![HVAC]*[FACILITIES]![CRV]*(Choose([FACILITIES]![HVAC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR3]",

Parent Object	Field Name	Calculated Field String
	PLUMB_DM	PLUMB_DM: [PERC_SYS_CRV]![PLUMB]*[FACILITIES]![CRV]*(Choose([FACILITIES]![PLUMB]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[
	CONV_DM	CONV_DM: [PERC_SYS_CRV]![CONV]*[FACILITIES]![CRV]*(Choose([FACILITIES]![CONV]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR3]",
	EQUIP_DM	EQUIP_DM: [PERC_SYS_CRV]![EQUIP]*[FACILITIES]![CRV]*(Choose([FACILITIES]![EQUIP]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[
	Facility_DM	Facility_DM: [STRUC_DM]+[EXT_DM]+[ROOF_DM]+[HVAC_DM]+[ELEC_DM]+[PLUMB_DM]+[CONV_DM]+[INTF_DM]+[EQUIP_DM]
	FCI	FCI: [CorrectedPerc]*[FACILITIES]![STRUC]+[PERC_SYS_CRV]![EXT]*[FACILITIES]![EXT]+[PERC_SYS_CRV]![ROOF]*[FACILITIES]![ROOF]+[PERC_SYS_CRV]![HVAC]*[FACILITIES]![HVAC]+[PERC_SYS_CRV]![ELEC]*[FACILITIES]![ELEC]+[PERC_SYS_CRV]![PLUMB]*[FACILITIES]![PLUMB]+[PE
	IntermediateFCICalc	IntermediateFCICalc: ([FACILITIES]![CRV]/DSum("[CRV]","[FACILITIES]","[FACILITIES]![CTR] = '" & [FACILITIES]![CTR] & "' AND [FACILITIES]![SITE] = '" & [FACILITIES]![SITE] & "' AND [FACILITIES]![INST] ='" & [FACILITIES]![INST] & "'"))*[FCI]
prod_Flat File View		
	CTR	
	SITE	
	INST	
	FAC	
	DESC	
	STAT	
	CRV	CRV: IIf([FACILITIES]![CRV] Is Null,0,[FACILITIES]![CRV])
	EXCL_YR	
	PERC_EXCL	
	CAPACITY	
	BUILT	
	DM_CAT_CODE	
	CLASS	
	STRUC	
	CorrectedPerc	CorrectedPerc: [PERC_SYS_CRV]![STRUC]+IIf([FACILITIES]![ROOF]=0 And [PERC_SYS_CRV]![ROOF]<>0,[PERC_SYS_CRV]![ROOF],0)+IIf([FACILITIES]![EXT]=0 And [PERC_SYS_CRV]![EXT]<>0,[PERC_SYS_CRV]![EXT],0)+IIf([FACILITIES]![INTF]=0 And [PERC_SYS_CRV]![INTF]<>0,[PERC
	STRUC_DM	STRUC_DM: [CorrectedPerc]*[FACILITIES]![CRV]*(Choose([FACILITIES]![STRUC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='STRUC'"),DLookUp("[CR3]","
	ROOF	
	ROOF_DM	ROOF_DM: [PERC_SYS_CRV]![ROOF]*[FACILITIES]![CRV]*(Choose([FACILITIES]![ROOF]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='ROOF'"),DLookUp("[CR3]",
	EXT	
	EXT_DM	EXT_DM: [PERC_SYS_CRV]![EXT]*[FACILITIES]![CRV]*(Choose([FACILITIES]![EXT]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='EXT'"),DLookUp("[CR3]","[PERC
	INTF	

Parent Object	Field Name	Calculated Field String
	INTF_DM	INTF_DM: [PERC_SYS_CRV]![INTF]*[FACILITIES]![CRV]*(Choose([FACILITIES]![INTF]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='INTF'"),DLookUp("[CR3]",
	ELEC	
	ELEC_DM	ELEC_DM: [PERC_SYS_CRV]![ELEC]*[FACILITIES]![CRV]*(Choose([FACILITIES]![ELEC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='ELEC'"),DLookUp("[CR3]",
	HVAC	
	HVAC_DM	HVAC_DM: [PERC_SYS_CRV]![HVAC]*[FACILITIES]![CRV]*(Choose([FACILITIES]![HVAC]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='HVAC'"),DLookUp("[CR3]",
	PLUMB	
	PLUMB_DM	PLUMB_DM: [PERC_SYS_CRV]![PLUMB]*[FACILITIES]![CRV]*(Choose([FACILITIES]![PLUMB]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='PLUMB'"),DLookUp("[
	CONV	
	CONV_DM	CONV_DM: [PERC_SYS_CRV]![CONV]*[FACILITIES]![CRV]*(Choose([FACILITIES]![CONV]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='CONV'"),DLookUp("[CR3]",
	EQUIP	
	EQUIP_DM	EQUIP_DM: [PERC_SYS_CRV]![EQUIP]*[FACILITIES]![CRV]*(Choose([FACILITIES]![EQUIP]+1,DLookUp("[CR0]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[CR1]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[CR2]","[PERC_CRV_COND]","[SYSTEM]='EQUIP'"),DLookUp("[
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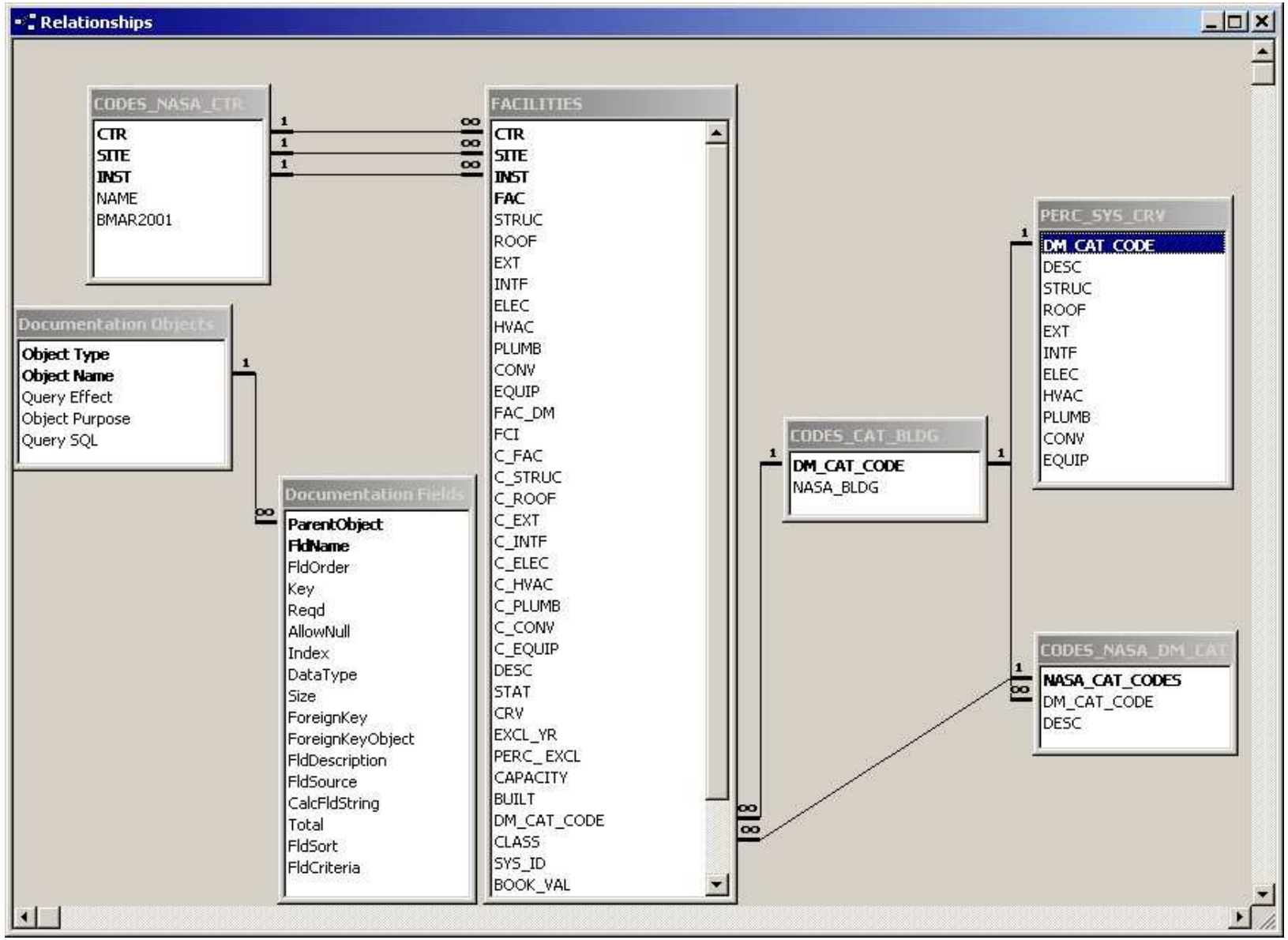
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Appendix D. Definitions

D.1 Electrical Facilities

A	STRUCTURE	**Definition:** The structure system in this sub-category applies to the foundations, super structure, slab, basement walls, floors, exterior stairways, loading docks, sidewalks, and parking lots [if they are found in buildings that house electrical systems]. Examples of structural systems within this sub-category includes facilities that are not actually buildings but electrical distrubution systems; power generation and power plants; electrical substations, switchgear, and transformer yards. These structures also apply to the power transmission towers and poles, manholes, tunnels for used power distribution and electrical vaults. For outdoor electrical facilities (i.e. sub-stations), the structure pertains to the foundations that support electrical components as well as the fences and surrrounding pavement. This system has a large CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible structural defects. This system should appear and work as new. Only normal preventive maintenance is required. Action items for corrective work should not exist. Additional observations: There is no evidence of separation of the main structural components. Pavement is continuous with no evidence of deterioration other than surface flaws. Fences are intact and have no missing or broken elements.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no structural issues that affect this facility's requirement to support NASA operations, missions and safety. Electricity is provided to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.
4	Good	**Assessment:** There are noticable but minor defects. These minor defects do not affect the structural integrity or intended use. Defects include misalignments in some of the main structural components that can be easily repaired; simple welds, re-attachment of hardware, etc. Minor corrective work is required. Additional observations: Overall pavement condition has less than 5% minor visual cracking; no major cracking is evident. Fences have less than 5% missing or broken elements.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety. Electricity is provided to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities

3	Fair	**Assessment:** There are noticable defects. Further deferment of action for these defects may affect the structural integrity or intended use of the facility. Defects include minor misalignment in the main structural components that requires substantial repair. Corrective work is required. Additional observations: Overall pavement condition has less than 10% minor visual cracking. Fences have less than 10% missing or broken elements.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on the user. Engineering should be involved at this point and a strong possibility exists that the action required for repair will result in a capital project. Structural issues may affect the facility's operations, missions and safety. Repairs to the structure system may interrupt electricity to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.
2	Poor	**Assessment:** Structural defects such as bending or misalignment of superstructure are evident and require substantial repair. Significant corrective work or component replacement is required. Further deterioration could render the structure unusable. Additional observations: Overall pavement condition has deep visual structural cracks. Fences have more than 10% but less than 25% missing or broken elements. Visible settlement in the foundations and pads.	**User Impact:** A large percentage of the structure system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require a capital project to repair the structure. Structural issues will affect the facility's operations, missions and safety. Repairs to the structure system will interrupt electricity to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities. Because of possible safety issues entry into certain areas may be restricted.
1	Bad	**Assessment:** There is major settling of foundations and footings. Major bending of the superstructure is evident. Structure is un-repairable; demolition/replacement is required. Structure is unsafe and will not support the mission at all. Additional observations: There is un-repairable alignment in the main structural components. Overall pavement condition has deep visual structural cracks that require total pavement replacement. Fence integrity does not exist and fence requires total replacement. Extreme settling of the foundations and pads.	**User Impact:** The structure is not safe or usable. Entry into the facility is restricted or prohibited due to possible personnel safety concerns. The structure system will shut down the facility's operations and missions. Demolition will have to take place. Structural issues will affect electrical requirements to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.

B	ROOF	**Definition:** The roof system in this sub-category applies to roofs in buildings that house electrical components or power generation equipment. For these, the roof consists of the roof covering, roof penetrations, gutters, and flashing. Roofs in this sub-category are typically galvanized shed roofs. This system has a very small CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** Building roof is watertight, with positive drainage, and sound flashing and penetrations. The roof system is new or looks to be in new condition. Only normal preventive maintenance is required. Action items for corrective work should not exist. Additional observations: There is no evidence of deterioration other than surface flaws. Roof feels firm or solid to walk on.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no roof related issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. These minor defects do not affect the roof's watertight integrity or intended use. Minor corrective work is required. Additional observations: there is loose flashing, plugged drains, some evidence of patching, and minor cracking of the roof surface that has not resulted in leaks.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects; minor leaks are possible. Without corrective action, these defects may affect the watertight integrity of the roof system. Corrective work is required. At this level, there is no significant interior damage.	**User Impact:** The system is providing minimal functionality; reliability is questionable; and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety. Roofing leaks may affect electrical components that support NASA missions and safety; leaks may interrupt electricity to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.

2	Poor	**Assessment:** The roof system is not waterproof. There are many defects including severe bubbling or cracking in composite roofing and standing water or substantial evidence of pooling in composite or other types of flat roofs. Significant repairs are required. There is significant leaking to the interior; there are substantial waterspots in ceiling tiles, bubbling in wall finishes or scaling on masonry type walls. A large percentage of the roof system is not functional because its integrity and reliability are highly questionable. Metal roofs may have rust through areas, missing fasteners and/or loose panels.	**User Impact:** A large percentage of the roof system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require a capital project funds to repair. The facility's operations, missions and safety will be affected. Repairs to the roof system will interrupt R&D services. Personnel safety may require a restricted access to certain areas. Roofing defects can affect electrical systems that influence NASA missions and safety; repairs to the roof may interrupt electricity to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.
1	Bad	**Assessment:** The roof system has significant leakage in many large areas. There is evidence of deterioration, drainage problems, and holes or cracks visible from inside the facility. The entire roof needs to be replaced. Re-roofing may also require the repair or replacement of wooden structural elements that support the roof (if applicable).	**User Impact:** Entry into spaces below the roof defects is restricted due to possible personnel safety issues. The facility, or major portions thereof, is uninhabitable due to leaks. Demolition will have to take place. Roofing defects will affect electrical systems that influence NASA missions and safety; electricity is not provided to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.
C	**EXTERIOR**	**Definition:** The exterior system for these facilities applies to exterior surfaces (including coatings and sealants), exterior walls, windows, and doors on buildings, sheds and trailers. The exterior surfaces or walls may be made of metal, brick, CMU, wood, or glass. This system has a small CRV percentage impact to this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible exterior defects. Exterior paint and surfaces are clean and look new. The exterior is considered watertight; the surfaces, paint coatings, and sealants are providing a complete weather barrier to the rest of the facility. There is no evidence of corrosion or surface deterioration. Doors and windows are fully functional and provide a good seal; gasket material is firm and shows no signs of cracking. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no exterior system issues that affect this facility's requirement to support NASA operations, missions and safety. Electricity is being provided to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.

4	Good	**Assessment:** Minor exterior wall surface defects are present; minor rust or other corrosion is evident on structural members; brick and mortar damage is visible with a small percentage needing replacement or repair. Some surface corrosion is evident; touch up painting is required. Small percentage of exterior window and door seals allow water to pass; exterior is not completely weatherproof. Some visible damage of leakage may be present. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** Exterior wall surface defects are present; limited brick and mortar damage is visible with a small percentage needing replacement or repair; a small percentage of metal siding needs replacement. Surface rust or corrosion is evident; painting is required for 25% of the surface area. Small percentage of exterior window and exterior door seals allow water to pass; exterior is not completely weatherproof. Leakage may be visible from inside the facility. Corrective work is required.	**User Impact:** The system is providing some functionality and reliability is questionable. Repairs to the exterior system such as exterior spot painting, calking and sealing leaks may require temporary relocation of sensitive equipment. Minor weatherproofing problems may inconvenience users. The deterioration of the facility's exterior system should not damage internal furniture or supplies. Energy effeciency may be reduced as well.
2	Poor	**Assessment:** Major exterior wall surface defects are present; brick and mortar damage is visible with a large percentage needing replacement or repair; significant sections of metal siding/skin are damaged and need repair or replacement. Significant surface corrosion is evident; painting is required for half of the surface area. A large percentage of exterior window and exterior door seals allow water to pass; exterior is creating weatherproof problems on other systems. Significant corrective work is required.	**User Impact:** A large percentage of the exterior system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require capital project funds. Weatherproofing problems will potentially damage the facility's contents. Energy effeciency is severely affected. Exterior defects will interrupt the facility's operations, missions and safety. Personnel safety may require a restricted access to certain areas.
1	Bad	**Assessment:** The exterior system has significant leakage in many large areas and is possibly unsafe. There is significant evidence of deterioration, corrosion, and holes or cracks visible from inside the facility. The entire exterior system needs to be replaced. A significant percentage of exterior window and exterior door seals allow water to pass; the exterior is not weatherproof.	**User Impact:** The exterior system is not safe and in the case of brick or masonry facades, has the potential to collapse. Without replacement of the exterior, personnel, equipment and supplies will be exposed to weather and probably be damaged by its condition. Demolition will have to take place so that a new exterior can be fabricated; this will impact the user and temporarily interrupt operations.

D	INTERIOR FINISHES	**Definition:** The interior system consists of the interior wall finishes, floor coverings, ceilings, doors and stairs of the buildings that house equipment in this sub-category. It does not include any internal structural walls (load bearing) or weather insulation but it can include specialized material, i.e. acoustical and fire proof materials. This system has a very small CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible interior defects. Interior paint and surfaces are clean and look new. The ceiling, flooring and wall materials are 100% intact; paint is continuous with no flaking; carpet and floor tiling show no fraying or chipping; ceiling tiles show no evidence of staining; stairway treds show no visible deterioration. Doors are fully functional. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no interior system issues that affect this facility's requirement to support NASA operations, missions and safety. The interior meets all requirements for it's intended work environment and is completely presentable.
4	Good	**Assessment:** Minor interior surface defects are present. There is evidence of very little marring, discoloration, fading or cracking. The ceiling, flooring and wall materials are mostly intact; touch up painting is required; carpet and floor tiling show little fraying or chipping; ceiling tiles show some staining; stairway treds have noticable deterioration. Small percentage of doors do not seal. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety. Interior defects should not affect electrical requirements that support NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.
3	Fair	**Assessment:** Interior surface defects are present. Ceiling, flooring and wall materials show evidence of marring, discoloration, fading or cracking; painting is required for 25% of the surface area; carpet and floor tiling show some fraying or chipping; ceiling tiles show staining; some stairway treds need to be replaced. Small percentage of doors do not seal properly. Corrective work is required.	**User Impact:** The system is providing some functionality and reliability. Repairs to the interior system such as spot painting, calking and replacement of floor/ceiling tiles may require temporary relocation of personnel and sensitive equipment. Minor weatherproofing problems may inconvenience users.

2	Poor	**Assessment:** Major interior surface defects are present; wear and tear is excessive. Ceiling tiles, flooring and wall materials have broken or damaged elements; carpet and floor tiling show worn traffic patterns, broken/cracked/missing tiles, and visible subflooring. Walls have holes or furniture related damage. Ceiling tiles are stained, missing, or broken. Many stairway treds need to be replaced. A large percentage of doors do not seal properly. Significant corrective work is required.	**User Impact:** A large percentage of the interior system is unusable or reliability is highly questionable. Significant corrrective work such as replacement of flooring and ceiling elements will temporarily impact users and disrupt the work environment. Interior defects may interrupt the facility's operations, missions and safety.
1	Bad	**Assessment:** The interior system shows significant damage, corrosion, or deterioration. The interior is not providing an aesthetic function; flooring or floor coverings require replacement and interior surfaces require complete repainting. Ceilings require refurbishment. The entire interior needs to be replaced.	**User Impact:** The interior system is not safe. Without replacement of the interior, personnel, equipment and supplies will be exposed or damaged by its condition. Demolition will have to take place so that a new interior can be fabricated; this will impact the user and temporarily interrupt operations. During any floor replacement or painting or ceiling work entry into the area will be restricted.

E	**ELECTRICAL**	**Definition:** The electrical system in this sub-category pertains to the electrical components of electrical distrubution systems; power generation and power plants; and electrical substations, switchgear, and transformer yards. Components include: dry and oil transformers, high/medium/low voltage conductors, insulators, electrical control systems, switchgear, breakers, panels, lighting and branch wiring. Turbines and generators are also evaluated in this system. If buildings are included, then they contain service and distribution switches, switchgear, breakers, transformers, panels, grounding systems, lighting fixtures, branch wiring, telecommunications systems, and security and fire protection monitoring systems. This system has the largest CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible electrical defects. This system should work as new. There are no electrical code issues. Only normal preventive maintenance is required. Action items for corrective work should not exist. All components function as designed. Electrical components show no signs of deterioration or defects. Transformers, turbines and generators have no visible fluid leakage. Electrical component lugs, connections and terminals have no evidence of corrosion or arcing. Insulators and high/medium/low voltage conductor surfaces are free of defects and show no signs of cracking or arcing; all wiring is appropriately connected. Turbines, generators, electrical control systems, switchgear, breakers, panels, and lighting function reliably. Electrical equipment is no greater than 20 years old.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no electrical issues that affect this facility's requirement to support NASA operations, missions and safety.

4	Good	**Assessment:** There are noticable but minor defects. Typically circuit breakers or switch gear need repairs. Equipment is modern and up to date. The system meets electrical code requirements. Monitoring systems are fully functional and provide reliable information. Wiring shows signs of aging but coatings are not cracking, dry, brittle or frayed. Minor corrective work is required. All components function as designed. Electrical components show some signs of deterioration or defects. Component surfaces have a very small amount of corrosion or deterioration. Transformers, turbines and generators show little visible evidence of fluid leakage. Electrical component lugs, connections and terminals have a very small amount of corrosion or arcing. Insulators and high/medium/low voltage conductor surfaces have limited defects with little signs of cracking or arcing; all wiring is appropriately connected. Turbines, generators, electrical control systems, switchgear, breakers, panels, and lighting have greater than a 95% reliability. Equipment may be greater than 20 years old.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety. Electricity is being provided to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities
3	Fair	**Assessment:** There are noticable defects. Equipment may be outdated but is mostly functional. There is a potential for electrical code violations. Monitoring systems function the majority of the time, but information may not be consistent. Wiring shows signs of aging with coatings that have very minor cracking and fraying or are dry and brittle Corrective work is required. Component surfaces have corrosion or deterioration. Transformers, Turbines and Generators show evidence of fluid leakage. Electrical component lugs, connections and terminals have evidence of corrosion or arcing. Insulators and high/medium/low voltage conductor surfaces have defects with signs of cracking or arcing; not all all wiring is appropriately connected. Turbines, generators, electrical control systems, switchgear, breakers, panels, and lighting are generally reliability. Equipment may be greater than 30 years old.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's electrical system may threaten or damage sensitive equipment if electrical service is interrupted or power surges occur. Electrical issues may affect the facility's operations, missions and safety.

2	Poor	**Assessment:** Electrical defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. Does not meet all electrical codes. Distribution switches, switchgear, circuit breakers, transformers, and/or panels may need to be replaced. Monitoring systems may not function and information is inconsistant and unreliable. Wires are exposed with cracking and fraying, and they are dry and brittle. Significant corrective work or component replacement is required. Component surfaces have significant corrosion or deterioration. Transformers, Turbines and Generators show evidence of major fluid leakage. Electrical component lugs, connections and terminals have major evidence of corrosion or arcing. Insulators and high/medium/low voltage conductor surfaces have significant defects with signs of significant cracking or arcing; wiring is not appropriately connected. Turbines, generators, electrical control systems, switchgear, breakers, panels, and lighting are not reliability. Equipment may be greater than 30 years old.	**User Impact:** A large percentage of the electrical system is unusable and/or unsafe. The system is not reliable; power supply is inconsistent and interrupted. Emergency generators are required to insure the most basic mission can be carried out. Electric motors, pumps, vacuums and other equipment can not be relied upon to function for the duration of a project. Significant corrrective work will impact users. The facility's operations, missions and safety will be affected. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials. Electrical defects will affect NASA missions and safety; loss of functionality may interrupt electricity to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current electrical codes and are unsafe. Distribution switches, switchgear, breakers, transformers, and panels show rust and exposed circuitry. The grounding system fails. Communications equipment does not work. Monitoring systems do not function. Transformers, Turbines, Generators have major fluid leaks. Turbines, generators, electrical control systems, switchgear, breakers, panels, transformers and lighting are are inoperable. Eletrical components are not connected. Serious deterioration and corrosion is evident. Equipment may be greater than 30 years old.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of power for environmental services. Demolition will have to take place. Electrical defects will affect NASA missions and safety; electricity is not provided to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.

F	HVAC	**Definition:** The heating, ventilation, and air conditioning (HVAC) system in this sub-category applies to buildings that contain window mounted ac units and air circulation fans, exterior pad mounted DX units, air handlers, heating fans, exhaust fans, controls. This system may also contain chillers, chilled water distribution piping and pumps, boilers or hot water generators used for heating purposes, hot water heating distribution piping and heat pumps, and testing & balancing instrumentation. This system contributes a very small percentage to the CRV in this sub-category. HVAC equipment in this sub-category is generally limited to equipment that maintains space environmental conditions only.	**User Impact**
5	Excellent	**Assessment:** There are no visible HVAC system defects and airflow is adequately controlled. This system should work like new. Equipment room is clean and neat. Only normal preventive maintenance is required. Action items for corrective work should not exist.	User Impact: There is no impact to the user; the system is functional and reliable. There are no HVAC issues that affect this facility's requirement to support NASA operations, missions and safety. HVAC is provided to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.
4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the HVAC systems. Those parts include fan sheaves, drain pans, drain lines, control valves, insulation, etc. There are signs of system modifications but the equipment is modern and up to date. These systems meet appropriate building codes. Monitoring systems are fully functional and provide reliable information. Aging is evident in pipes and ducting. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding environmental control are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. An HVAC unit or two may be out of service awaiting parts for repair, or awaiting bearing replacements on air handlers and other fans. Although equipment may be outdated, this system is mostly functional. A large number of complaints are being reported by building users that say the system will not control temperature within the building. There is a potential for building code violations. Some signs of corrosion, leaking, alarm indicators in alarm and poor housekeeping are evident. Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A large number of complaints regarding environmental control are being reported by building users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's HVAC system may threaten or damage sensitive equipment or stored supplies if service is interrupted. HVAC issues may affect the facility's operations, missions and safety.

2	Poor	**Assessment:** HVAC component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. Window mounted ac units and air circulation fans are being replaced on an irregular basis. Monitoring and control systems may not function. Piping, duct work, insulation, and control valves show significant signs of repair or replacement. Poor housekeeping and loose maintenance practices are producing excessive corrosion, air and water leakage, and alarm indications. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the HVAC system is unusable and/or unsafe. The system is not reliable; environmental controls are inconsistent. Significant corrrective work will shut off air conditioning or heat thus impacting users. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials. The facility's operations, missions and safety will be affected.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Window mounted ac units and air circulation fans do not work. Other HVAC systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of environmental services. Demolition will have to take place.
G	**PLUMBING**	**Definition:** The plumbing system within this sub-category consists of fire protection plumbing, potable water systems, a sanitary sewer, and bathrooms found in electrical buildings. Components include all fixtures, piping, valves and associated pumpage equipment for the generation or distribution of any fluid or gas system. This system contributes a very small percentage to the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible plumbing system defects. This system should work like new. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no plumbing issues that affect this facility's requirement to support NASA operations, missions and safety.

4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the plumbing system but there are no leaks at the flanges or fittings. Those parts include pipe flanges, valve fixtures, associated pumpage equipment, drain lines, control valves, house pumps and water tanks. There are signs of system modifications; it is possible to find the need for pump seal repairs or valve repacking. These systems meet appropriate building codes. Aging is evident in pipes. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding plumbing services are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Although plumbing may be older, this system is mostly functional. There is a potential for building code violations. Corrosion and leaking are noticeable on bathroom fixtures and system equipment. Piping system flanges and/or fittings leak; pooling is evident. Pump repairs and/or rebuilds are a common occurrence. Alarm indicators are in alarm and poor housekeeping is evident. Corrective work is required.	**User Impact:** The system is providing some functionality, reliability is questionable, and repairs may have minor impact on users. Leaks from the plumbing system may threaten or damage sensitive equipment. A large number of plumbing complaints are being reported by building users. Plumbing issues may affect the facility's operations, missions and safety [like leaks to the fire suppression system]. Loss of this system creates a safety problem to the facility and can shut down the facility due to safety violations.
2	Poor	**Assessment:** Plumbing component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Fixtures and other system components may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. There are areas of large pooling and water containment; there is excessive corrosion, water leakage, and alarm indications; pumps and piping systems need complete sections replaced or complete rebuilds. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the plumbing system is unusable and/or unsafe. The system is not reliable; the fire suppression system can not be relied upon to adequately protect equipment, supplies, and personnel. Significant corrrective work may shut off plumbing services thus impacting users. Plumbing failures will result in damage to sensitive materials. The facility's operations, missions and safety will be affected.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Fixtures, pumps, and fire suppression piping does not work. Plumbing systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of plumbing services. Demolition will have to take place. Plumbing defects will affect NASA missions and safety; electricity is not provided to NASA safety systems, water and fuel processing systems, R&D facilities, mission control facilities, communications and support facilities.

H	**CONVEYANCE**	**Definition:** The conveyance system in this sub-category is not rated.	**User Impact**
5	Excellent		Not Applicable
4	Good		Not Applicable
3	Fair		Not Applicable
2	Poor		Not Applicable
1	Bad		Not Applicable
I	**PROGRAM SUPPORT EQUIPMENT**	**Definition:** Program support equipment is not rated in this sub-category.	**User Impact**
5	Excellent		Not Applicable
4	Good		Not Applicable
3	Fair		Not Applicable
2	Poor		Not Applicable (2)
1	Bad		Not Applicable

D.2 Research and Development Facilities

A	STRUCTURE	**Definition:** The structure system in this sub-category applies to the foundations, super structure, slab, basement walls, floors, exterior stairways, loading docks, sidewalks, and parking lots [all of which are found on most R&D buildings]. Examples of structural systems within this sub-category includes facilities that are not actually buildings but instead are the R&D devices themselves; i.e. vacuum test chambers, clean room equipment, or centrifuges. This system has the largest CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible structural defects. This system should appear and work as new. Only normal preventive maintenance is required. Action items for corrective work should not exist.	U**ser Impact:** There is no impact to the user; the system is functional and reliable. There are no structural issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. These minor defects do not affect the structural integrity or intended use. Defects include misalignments in some of the main structural components that can be easily repaired; simple welds, re-attachment of hardware, etc. Minor corrective work is required. Additional observations: Minor crazing or cracking may exist on facilities and/or paved areas.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Further deferment of action for these defects may affect the structural integrity or intended use of the facility. Defects include minor misalignment in the main structural components that requires substantial repair. Corrective work is required. Additional observations: Cracking, crazing, and/or visual defects exist on facilities and/or paved areas.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety. Repairs to the structure system may affect R&D services.
2	Poor	**Assessment:** Structural defects such as bending or misalignment of superstructure are evident and require substantial repair. Significant corrective work or component replacement is required. Further deterioration could render the structure unusable.	**User Impact:** A large percentage of the structure system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require a capital project to repair the structure. Structural issues will affect the facility's operations, missions and safety. Repairs to the structure system will interrupt R&D services. Because of possible safety issues entry into certain areas may be restricted.

1	Bad	**Assessment:** There is major settling of foundations and footings. Major bending of the superstructure is evident. Structure is un-repairable; demolition/replacement is required. Structure is unsafe and will not support the mission at all.	**User Impact:** The structure is not safe or usable. Entry into the facility is restricted or prohibited due to possible personnel safety concerns. The structure system will shut down the facility's operations and missions. Demolition will have to take place.
B	**ROOF**	**Definition:** The roof system in this sub-category applies to roofs in buildings that house R&D components and equipment. For these, the roof consists of the roof covering, roof penetrations, gutters, and flashing. Roofs in this sub-category are typically made of all types of materials. This system has a small CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** Building roof is watertight, with positive drainage, and sound flashing and penetrations. The roof system is new or looks to be in new condition. Only normal preventive maintenance is required. Action items for corrective work should not exist. Additional observations: There is no evidence of deterioration other than surface flaws. Roof feels firm or solid to walk on.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no roof related issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. These minor defects do not affect the roof's watertight integrity or intended use. Minor corrective work is required. Additional observations: there is loose flashing, plugged drains, some evidence of patching, and minor cracking of the roof surface that has not resulted in leaks.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects; minor leaks are possible. Without corrective action, these defects may affect the watertight integrity of the roof system. Corrective work is required. At this level, there is no significant interior damage. Additional observations: Bubbling and some cracking is evident in composite or built up roofing. There is limited standing water or evidence of pooling in composite or other types of flat roofs. There may be evidence of substantial patching. The interior of a facility may show limited waterspots in ceiling tiles, bubbling in wall finishes or scaling on masonry type walls. Metal roofs may require coating to seal minor leaks, they may have surface rust and may have some panel fasteners missing.	**User Impact:** The system is providing minimal functionality; reliability is questionable; and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety.

2	Poor	**Assessment:** The roof system is not waterproof. There are many defects including severe bubbling or cracking in composite roofing and standing water or substantial evidence of pooling in composite or other types of flat roofs. Significant repairs are required. There is significant leaking to the interior; there are substantial waterspots in ceiling tiles, bubbling in wall finishes or scaling on masonry type walls. A large percentage of the roof system is not functional because its integrity and reliability are highly questionable. Metal roofs may have rust through areas, missing fasteners and/or loose panels.	**User Impact:** A large percentage of the roof system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require a capital project funds to repair. The facility's operations, missions and safety will be affected. Repairs to the roof system will interrupt R&D services. Personnel safety may require a restricted access to certain areas. Interior finishes highly likely to be damaged by weather.
1	Bad	**Assessment:** The roof system has significant leakage in many large areas. There is evidence of deterioration, drainage problems, and holes or cracks visible from inside the facility. The entire roof needs to be replaced. Re-roofing may also require the repair or replacement of wooden structural elements that support the roof (if applicable).	**User Impact:** Entry into spaces below the roof defects is restricted due to possible personnel safety issues. The facility, or major portions thereof, is uninhabitable due to leaks. Demolition will have to take place.
C	**EXTERIOR**	**Definition:** The exterior system for these facilities applies to exterior surfaces (including coatings and sealants), exterior walls, windows, and doors on buildings, sheds and trailers. The exterior surfaces or walls may be made of metal, brick, CMU, wood, or glass. This system has a relatively large (14%) CRV percentage impact to this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible exterior defects. Exterior paint and surfaces are clean and look new. The exterior is considered watertight; the surfaces, paint coatings, and sealants are providing a complete weather barrier to the rest of the facility. There is no evidence of corrosion or surface deterioration. Doors and windows are fully functional and provide a good seal; gasket material is firm and shows no signs of cracking. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no exterior system issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** Minor exterior wall surface defects are present; minor rust or other corrosion on structural members; brick and mortar damage is visible with a small percentage needing replacement or repair. Some surface corrosion is evident; touch up painting is required. Small percentage of exterior window and door seals allow water to pass; exterior is not completely weatherproof. Some visible damage of leakage may be present. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.

3	Fair	**Assessment:** Exterior wall surface defects are present; limited brick and mortar damage is visible with a small percentage needing replacement or repair; a small percentage of metal siding needs replacement. Surface rust or corrosion is evident; painting is required for 25% of the surface area. Small percentage of exterior window and exterior door seals allow water to pass; exterior is not completely weatherproof. Leakage may be visible from inside the facility. Corrective work is required.	**User Impact:** The system is providing some functionality and reliability is questionable. Repairs to the exterior system such as exterior spot painting, calking and sealing leaks may require temporary relocation of sensitive equipment. Minor weatherproofing problems may inconvenience users. The deterioration of the facility's exterior system should not damage internal furniture or supplies. Energy effeciency may be reduced as well.
2	Poor	**Assessment:** Major exterior wall surface defects are present; brick and mortar damage is visible with a large percentage needing replacement or repair; significant sections of metal siding/skin are damaged and need repair or replacement. Significant surface corrosion is evident; painting is required for half of the surface area. A large percentage of exterior window and exterior door seals allow water to pass; exterior is creating weatherproof problems on other systems. Significant corrective work is required.	**User Impact:** A large percentage of the exterior system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require capital project funds. Weatherproofing problems will potentially damage the facility's contents. Energy effeciency is severely affected. Exterior defects will interrupt the facility's operations, missions and safety. Personnel safety may require a restricted access to certain areas.
1	Bad	**Assessment:** The exterior system has significant leakage in many large areas and is possibly unsafe. There is significant evidence of deterioration, corrosion, and holes or cracks visible from inside the facility. The entire exterior system needs to be replaced. A significant percentage of exterior window and exterior door seals allow water to pass; the exterior is not weatherproof.	**User Impact:** The exterior system is not safe and in the case of brick or masonry facades, has the potential to collapse. Without replacement of the exterior, personnel, equipment and supplies will be exposed to weather and probably be damaged by its condition. Demolition will have to take place so that a new exterior can be fabricated; this will impact the user and temporarily interrupt operations.

D	INTERIOR FINISHES	**Definition:** The interior system consists of the interior wall finishes, floor coverings, ceilings, doors and stairs of the buildings that house equipment in this sub-category. It does not include any internal structural walls (load bearing) or weather insulation but it can include specialized material, i.e. acoustical and fire proof materials. This system has a small CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible interior defects. Interior paint and surfaces are clean and look new. The ceiling, flooring and wall materials are 100% intact; paint is continuous with no flaking; carpet and floor tiling show no fraying or chipping; ceiling tiles show no evidence of staining; stairway treds show no visible deterioration. Doors are fully functional. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no interior system issues that affect this facility's requirement to support NASA operations, missions and safety. The interior meets all requirements for it's intended work environment and is completely presentable.
4	Good	**Assessment:** Minor interior surface defects are present. There is evidence of very little marring, discoloration, fading or cracking. The ceiling, flooring and wall materials are mostly intact; touch up painting or spackling is required; carpet and floor tiling show little fraying or chipping; ceiling tiles show some staining; stairway treds have noticable deterioration. Small percentage of doors do not seal. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** Interior surface defects are present. Ceiling, flooring and wall materials show evidence of marring, discoloration, fading or cracking; painting is required for 25% of the surface area; carpet and floor tiling show some fraying or chipping; ceiling tiles show staining; some stairway treds need to be replaced. Small percentage of doors do not seal properly. Corrective work is required.	**User Impact:** The system is providing some functionality and reliability. Repairs to the interior system such as spot painting, calking and replacement of floor/ceiling tiles may require temporary relocation of personnel and sensitive equipment. Minor weatherproofing problems may inconvenience users.
2	Poor	**Assessment:** Major interior surface defects are present; wear and tear is excessive. Ceiling tiles, flooring and wall materials have broken or damaged elements; carpet and floor tiling show worn traffic patterns, broken/cracked/missing tiles, and visible subflooring. Walls have holes or furniture related damage. Ceiling tiles are stained, missing, or broken. Many stairway treds need to be replaced. A large percentage of doors do not seal properly. Significant corrective work is required.	**User Impact:** A large percentage of the interior system is unusable or reliability is highly questionable. Significant corrrective work such as replacement of flooring and ceiling elements will temporarily impact users and disrupt the work environment. Interior defects may interrupt the facility's operations, missions and safety.

1	Bad	**Assessment:** The interior system shows significant damage, corrosion, or deterioration. The interior is not providing an aesthetic function; flooring or floor coverings require replacement and interior surfaces require complete repainting. Ceilings require refurbishment. The entire interior needs to be replaced.	**User Impact:** The interior system is not safe. Without replacement of the interior, personnel, equipment and supplies will be exposed or damaged by its condition. Demolition will have to take place so that a new interior can be fabricated; this will impact the user and temporarily interrupt operations. During any floor replacement or painting or ceiling work entry into the area will be restricted.
E	**ELECTRICAL**	**Definition:** The electrical system in this sub-category applies to buildings that contain all service and distribution switches, switchgear, breakers, transformers, panels, grounding systems, lighting fixtures, branch wiring, telecommunications systems, and security and fire protection monitoring systems. This system has a relatively large (20%) CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible electrical defects. This system should work as new. There are no electrical code issues. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no electrical issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. Typically circuit breakers or switch gear need repairs. Equipment is modern and up to date. The system meets electrical code requirements. Monitoring systems are fully functional and provide reliable information. Wiring shows signs of aging but coatings are not cracking, dry, brittle or frayed. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Equipment may be outdated but is mostly functional. There is a potential for electrical code violations. Monitoring systems function the majority of the time, but information may not be consistent. Wiring shows signs of aging with coatings that have very minor cracking and fraying or are dry and brittle Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's electrical system may threaten or damage sensitive equipment if electrical service is interrupted or power surges occur. Electrical issues may affect the facility's operations, missions and safety.

2	Poor	**Assessment:** Electrical defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. Does not meet all electrical codes. Distribution switches, switchgear, circuit breakers, transformers, and/or panels may need to be replaced. Monitoring systems may not function and information is inconsistant and unreliable. Wires are exposed with cracking and fraying, and they are dry and brittle. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the electrical system is unusable and/or unsafe. The system is not reliable; power supply is inconsistent and interrupted. Emergency generators are required to insure the most basic mission can be carried out. Electric motors, pumps, vacuums and other equipment can not be relied upon to function for the duration of a project. Significant corrrective work will impact users. The facility's operations, missions and safety will be affected. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current electrical codes and are unsafe. Distribution switches, switchgear, breakers, transformers, and panels show rust and exposed circuitry. The grounding system fails. Communications equipment does not work. Monitoring systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of power for environmental services. Demolition will have to take place.
F	**HVAC**	**Definition:** The heating, ventilation, and air conditioning (HVAC) system in this sub-category applies to buildings that contain window mounted ac units and air circulation fans, exterior pad mounted DX units, air handlers, heating fans, exhaust fans, controls. This system may also contain chillers, chilled water distribution piping and pumps, boilers or hot water generators used for heating purposes, hot water heating distribution piping and heat pumps, and testing & balancing instrumentation. This system contributes a small percentage to the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible HVAC system defects and air flow is adequately controlled. This system should work like new. Equipment room is clean and neat. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no HVAC issues that affect this facility's requirement to support NASA operations, missions and safety.

4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the HVAC systems. Those parts include fan sheaves, drain pans, drain lines, control valves, insulation, etc. There are signs of system modifications but the equipment is modern and up to date. These systems meet appropriate building codes. Monitoring systems are fully functional and provide reliable information. Aging is evident in pipes and ducting. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding environmental control are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. An HVAC unit or two may be out of service awaiting parts for repair, or awaiting bearing replacements on air handlers and other fans. Although equipment may be outdated, this system is mostly functional. A large number of complaints are being reported by building users that say the system will not control temperature within the building. There is a potential for building code violations. Some signs of corrosion, leaking, alarm indicators in alarm and poor housekeeping are evident. Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A large number of complaints regarding environmental control are being reported by building users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's HVAC system may threaten or damage sensitive equipment or stored supplies if service is interrupted. HVAC issues may affect the facility's operations, missions and safety.
2	Poor	**Assessment:** HVAC component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. Window mounted ac units and air circulation fans are being replaced on an irregular basis. Monitoring and control systems may not function. Piping, duct work, insulation, and control valves show significant signs of repair or replacement. Poor housekeeping and loose maintenance practices are producing excessive corrosion, air and water leakage, and alarm indications. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the HVAC system is unusable and/or unsafe. The system is not reliable; environmental controls are inconsistent. Significant corrrective work will shut off air conditioning or heat thus impacting users. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials. The facility's operations, missions and safety will be affected.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Window mounted ac units and air circulation fans do not work. Other HVAC systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of environmental services. Demolition will have to take place.

G	PLUMBING	**Definition:** The plumbing system within this sub-category consists of fire protection plumbing, potable water systems, a sanitary sewer, and bathrooms found in buildings. Components include all fixtures, piping, valves and associated pumpage equipment. This system contributes a small percentage to the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible plumbing system defects. This system should work like new. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no plumbing issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the plumbing system but there are no leaks at the flanges or fittings. Those parts include pipe flanges, valve fixtures, associated pumpage equipment, drain lines, control valves, house pumps and water tanks. There are signs of system modifications; it is possible to find the need for pump seal repairs or valve repacking. These systems meet appropriate building codes. Aging is evident in pipes. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding plumbing services are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Although plumbing may be older, this system is mostly functional. There is a potential for building code violations. Corrosion and leaking are noticeable on bathroom fixtures and system equipment. Piping system flanges and/or fittings leak; pooling is evident. Pump repairs and/or rebuilds are a common occurrence. Alarm indicators are in alarm and poor housekeeping is evident. Corrective work is required.	**User Impact:** The system is providing some functionality, reliability is questionable, and repairs may have minor impact on users for a short period of time. Leaks from the plumbing system may threaten or damage sensitive equipment. A large number of plumbing complaints are being reported by building users. Plumbing issues may affect the facility's operations, missions and safety [like leaks to the fire suppression system].
2	Poor	**Assessment:** Plumbing component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Fixtures and other system components may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. There are areas of large pooling and water containment; there is excessive corrosion, water leakage, and alarm indications; pumps and piping systems need complete sections replaced or complete rebuilds. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the plumbing system is unusable and/or unsafe. The system is not reliable; the fire suppression system can not be relied upon to adequately protect equipment, supplies, and personnel. Significant corrrective work may shut off plumbing services thus impacting users. Plumbing failures will result in damage to sensitive materials. The facility's operations, missions and safety will be affected.

1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Fixtures, pumps, and fire suppression piping does not work. Plumbing systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of plumbing services. Demolition will have to take place.
H	**CONVEYANCE**	**Definition:** The conveyance system in this sub-category consists of the personnel or maintenance elevators, escalators, cranes over 50 tons and other specialized lifts. This system contributes a very small percentage of the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible conveyance system defects. This system should work like new. Certification is up-to-date. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no conveyance issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the conveyance system but system is certified. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Although the system may be older, it is mostly functional; the system is certified. There is a potential for building code violations. Corrosion and leaking are noticeable on system components. Corrective work is required.	**User Impact:** The system is providing some functionality, reliability is questionable, and repairs may have minor impact on users for a short period of time. Conveyance issues may affect the facility's operations, missions and safety.
2	Poor	**Assessment:** Conveyance component defects are evident and require substantial repair or replacement; system may not be certified. System experiences infrequent failures. System components may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the conveyance system is unusable and/or unsafe; this system should not be used until re-certified. The system is not reliable and needs to be inspected.
1	Bad	**Assessment:** The system is un-repairable; replacement is required because user is unable to maintain certification. Repair parts are not readily available due to age. System does not meet current building codes and is unsafe. Conveyance systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out. Demolition will have to take place.

I	PROGRAM SUPPORT EQUIPMENT	**Definition:** Program support equipment consists of test and research equipment that is physically affixed to the main structure it supports; i.e. vacuum test chambers, clean rooms, centrifuges and hydraulics not associated with lifts or elevators. The Program Support Equipment comprises a relatively large (16%) percentage of the CRV for the facilities in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible system defects. This system should work like new. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no program supprot equipment issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the conveyance system but system is certified. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Although the system may be older, it is mostly functional; the system is certified. Corrosion and leaking are noticeable on system components. Corrective work is required.	**User Impact:** The system is providing some functionality, reliability is questionable, and repairs may have minor impact on users for a short period of time. Program Support Equipment issues may affect the facility's operations, missions and safety. Equipment may not operate every time.
2	Poor	**Assessment:** Program Support component defects are evident and require substantial repair or replacement. System experiences infrequent failures. System components may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the Program Support Equipment is unusable and/or unsafe; this equipment should not be used until re-certified. Significant repairs may impact user. Equipment is not able to meet testing schedules.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. System does not meet current building codes and is unsafe.	**User Impact:** The Program Support quipment is unusable and unrepairable. The equipment is tagged out. Demolition will have to take place.

D.3 Fluid Handling Facilities

A	STRUCTURE	**Definition:** The structure system in this sub-category applies to the foundations, super structure, slab, basement walls, floors, exterior stairways, loading docks, sidewalks, and parking lots [if they are found in buildings that house fluid and gas systems]. Examples of structural systems within this sub-category includes facilities that are not actually buildings but specialized fuel facilities that include vessels, tanks, fluid storage systems, major pipes or pipelines, and containment basins of assorted types including (i) dikes, berms, or retaining walls sufficiently impervious to contain oil; (ii) curbing; (iii) culverting, gutters, or other drainage systems. This system constitutes the largest (47%) percentage of the CRV and is the key system for this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible structural defects. This system should appear and work as new. Only normal preventive maintenance is required. Action items for corrective work should not exist. Additional observations: The super structure, tanks, vessels pipes and pipelines have no damage such as dents or bending. There may be minor crazing or cracking in the footing and foundation walls or other concrete retaining walls. There are no signs of leakage or discharge in structural components.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no structural issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. These minor defects do not affect the structural integrity or intended use. Defects include misalignments in some of the main structural components that can be easily repaired; simple welds, re-attachment of hardware, etc. Minor corrective work is required. Additional observations: There may be minor dings and dents in the superstructure, vessels, tanks, pipes and pipelines. Larger cracks may appear in the concrete foundations, footings, or containment systems. Minor seepage or discharge evident (staining) in structural members such as tanks, vessels, pipes and pipeline but there is no ponding.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.

3	Fair	**Assessment:** There are noticable defects. Further deferment of action for these defects may affect the structural integrity or intended use of the facility. Defects include minor misalignment in the main structural components that requires substantial repair. Corrective work is required. Additional observations: Major dents and even some bending of structural components but not to the point of failure. Cracking, crazing, and/or visual defects such as spalling, in concrete footings, foundations and containment systems. Some (active drips or pooling) leakage evident in structural members such as tanks, vessels, pipes and pipeline.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety. Repairs to the structure system may temporarily affect fluid operations.
2	Poor	**Assessment:** Structural defects such as bending or misalignment of superstructure are evident and require substantial repair. Significant corrective work or component replacement is required. Further deterioration could render the structure unusable. Additional observations: There is visible settlement, major cracking, and spalling of concrete structural members. Active discharge and pooling is evident around structural members such as tanks, vessels, pipes and pipelines. Containment system contains liquid from discharge.	**User Impact:** A large percentage of the structure system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require a capital project to repair the structure. Structural issues will affect the facility's operations, missions and safety. Repairs to the structure system will interrupt fluid services. Parts of this system may be taken off line or bypassed to continue operations. Because of possible safety issues entry into certain areas may be restricted to construction and maintenance personnel after proper safety requirements and precautions have been satisfied.
1	Bad	**Assessment:** There is major settling of foundations and footings. Major bending of the superstructure is evident. Structure is un-repairable; demolition/replacement is required. Structure is unsafe and will not support the mission at all. Additional observations: Holes are evident in tanks and vessels. Joints in piping and pipelines cannot be sealed. Concrete structural members are deteriorating.	**User Impact:** The structure is not safe or usable. Entry into the facility is restricted or prohibited due to possible personnel safety concerns. The structure system will shut down the facility's operations and missions. Demolition will have to take place.

B	ROOF	**Definition:** The roof system in this sub-category applies to roofs in buildings that house fluid components, fluid operations controls and/or parts storage. For these, the roof consists of the roof covering, roof penetrations, gutters, and flashing. Roofs in this sub-category are typically small in size and made of various types of material. This system has a small CRV percentage impact to the sub-category. The tops of storage tanks and vessels are not considered to be roofing; they are part of the structure system.	**User Impact**
5	Excellent	**Assessment:** Building roof is watertight, with positive drainage, and sound flashing and penetrations. The roof system is new or looks to be in new condition. Only normal preventive maintenance is required. Action items for corrective work should not exist. Additional observations: There is no evidence of deterioration other than surface flaws. Roof feels firm or solid to walk on.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no roof related issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. These minor defects do not affect the roof's watertight integrity or intended use. Minor corrective work is required. Additional observations: there is loose flashing, plugged drains, some evidence of patching, and minor cracking of the roof surface that has not resulted in leaks.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects; minor leaks are possible. Without corrective action, these defects may affect the watertight integrity of the roof system. Corrective work is required. At this level, there is no significant interior damage.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety. Desks and electronic equipment may have to be moved. Buckets may be needed at one or two places to catch water during heavy rains.

2	Poor	**Assessment:** The roof system is not waterproof. There are many defects including severe bubbling or cracking in composite roofing and standing water or substantial evidence of pooling in composite or other types of flat roofs. Significant repairs are required. There is significant leaking to the interior; there are substantial waterspots in ceiling tiles, bubbling in wall finishes or scaling on masonry type walls. A large percentage of the roof system is not functional because its integrity and reliability are highly questionable. Metal roofs may have rust through areas, missing fasteners and/or loose panels.	**User Impact:** A large percentage of the roof system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require a capital project funds to repair. The facility's operations, missions and safety will be affected. Repairs to the roof system will interrupt R&D services. Personnel safety may require a restricted access to certain areas. Desks and electronic equipment may have to be moved from rooms or portions of the buildings. Many buckets may be needed to catch water during rains.
1	Bad	**Assessment:** The roof system has significant leakage in many large areas. There is evidence of deterioration, drainage problems, and holes or cracks visible from inside the facility. The entire roof needs to be replaced. Re-roofing may also require the repair or replacement of wooden structural elements that support the roof (if applicable).	**User Impact:** Entry into spaces below the roof defects is restricted due to possible personnel safety issues. The facility, or major portions thereof, is uninhabitable due to leaks. Demolition will have to take place.
C	**EXTERIOR**	**Definition:** The exterior system for these facilities applies to exterior surfaces (including coatings and sealants), exterior walls, windows, and doors on buildings, sheds and trailers. The exterior surfaces or walls may be made of metal, brick, CMU, wood, or glass. This system has a small CRV percentage impact to this sub-category. The exterior system may consists of the skin of the structural components, superstructure, vessels, tanks, major pipes or pipeline. Buildings in this sub-category may house equipment, operations controls and stored parts.	**User Impact**
5	Excellent	**Assessment:** There are no visible exterior defects. Exterior paint and surfaces are clean and look new. The exterior is considered watertight; the surfaces, paint coatings, and sealants are providing a complete weather barrier to the rest of the facility. There is no evidence of corrosion or surface deterioration. Doors and windows are fully functional and provide a good seal; gasket material is firm and shows no signs of cracking. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no exterior system issues that affect this facility's requirement to support NASA operations, missions and safety.

4	Good	**Assessment:** Minor exterior wall surface defects are present; minor rust or other corrosion on structural members; brick and mortar damage is visible with a small percentage needing replacement or repair. Some surface corrosion is evident; touch up painting is required. Small percentage of exterior window and door seals allow water to pass; exterior is not completely weatherproof. Some visible damage of leakage may be present. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** Exterior wall surface defects are present; limited brick and mortar damage is visible with a small percentage needing replacement or repair; a small percentage of metal siding needs replacement. Surface rust or corrosion is evident; painting is required for 25% of the surface area. Small percentage of exterior window and exterior door seals allow water to pass; exterior is not completely weatherproof. Leakage may be visible from inside the facility. Corrective work is required.	**User Impact:** The system is providing some functionality and reliability is questionable. Repairs to the exterior system such as exterior spot painting, calking and sealing leaks may require temporary relocation of sensitive equipment. Minor weatherproofing problems may inconvenience users. The deterioration of the facility's exterior system should not damage internal furniture or supplies. Energy effeciency may be reduced as well.
2	Poor	**Assessment:** Major exterior wall surface defects are present; brick and mortar damage is visible with a large percentage needing replacement or repair; significant sections of metal siding/skin are damaged and need repair or replacement. Significant surface corrosion is evident; painting is required for half of the surface area. A large percentage of exterior window and exterior door seals allow water to pass; exterior is creating weatherproof problems on other systems. Significant corrective work is required. Corrosion problems are causing a periodic malfunction of this system.	**User Impact:** A large percentage of the exterior system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require capital project funds. Weatherproofing problems will potentially damage the facility's contents. Energy effeciency is severely affected. Exterior defects will interrupt the facility's operations, missions and safety. Personnel safety may require a restricted access to certain areas.
1	Bad	**Assessment:** The exterior system has significant leakage in many large areas and is possibly unsafe. There is significant evidence of deterioration, corrosion, and holes or cracks visible from inside the facility. The entire exterior system needs to be replaced. A significant percentage of exterior window and exterior door seals allow water to pass; the exterior is not weatherproof.	**User Impact:** The exterior system is not safe and in the case of brick or masonry facades, has the potential to collapse. Without replacement of the exterior, personnel, equipment and supplies will be exposed to weather and probably be damaged by its condition. Demolition will have to take place so that a new exterior can be fabricated; this will impact the user and temporarily interrupt operations.

D	INTERIOR FINISHES	**Definition:** The interior system consists of the interior wall finishes, floor coverings, ceilings, doors and stairs of the buildings that house equipment in this sub-category. It does not include any internal structural walls (load bearing) or weather insulation but it can include specialized material, i.e. acoustical and fire proof materials. This system has a very small CRV percentage impact to the sub-category. Specific to this sub-category are the interiors of vessels, tanks, other fluid storage, major pipes or pipeline which are not typically assessed. However, the interior system to small buildings that house equipment, operations controls, and store parts are assessed.	**User Impact**
5	Excellent	**Assessment:** There are no visible interior defects. Interior paint and surfaces are clean and look new. The ceiling, flooring and wall materials are 100% intact; paint is continuous with no flaking; carpet and floor tiling show no fraying or chipping; ceiling tiles show no evidence of staining; stairway treds show no visible deterioration. Doors are fully functional. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no interior system issues that affect this facility's requirement to support NASA operations, missions and safety. The interior meets all requirements for it's intended work environment and is completely presentable.
4	Good	**Assessment:** Minor interior surface defects are present. There is evidence of very little marring, discoloration, fading or cracking. The ceiling, flooring and wall materials are mostly intact; touch up painting or spackling is required; carpet and floor tiling show little fraying or chipping; ceiling tiles show some staining; stairway treds have noticable deterioration. Small percentage of doors do not seal. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** Interior surface defects are present. Ceiling, flooring and wall materials show evidence of marring, discoloration, fading or cracking; painting is required for 25% of the surface area; carpet and floor tiling show some fraying or chipping; ceiling tiles show staining; some stairway treds need to be replaced. Small percentage of doors do not seal properly. Corrective work is required. Wear and tear on floors ans carpets is noticeable especially in high traffic areas.	**User Impact:** The system is providing some functionality and reliability. Repairs to the interior system such as spot painting, calking and replacement of floor/ceiling tiles may require temporary relocation of personnel and sensitive equipment. Minor weatherproofing problems may inconvenience users. Work environment tends to be dingy, not clean or professional looking.

2	Poor	**Assessment:** Major interior surface defects are present; wear and tear is excessive. Ceiling tiles, flooring and wall materials have broken or damaged elements; carpet and floor tiling show worn traffic patterns, broken/cracked/missing tiles, and visible subflooring. Walls have holes or furniture related damage. Ceiling tiles are stained, missing, or broken. Many stairway treds need to be replaced. A large percentage of doors do not seal properly. Significant corrective work is required. Filthy appearance.	**User Impact:** A large percentage of the interior system is unusable or reliability is highly questionable. Significant corrrective work such as replacement of flooring and ceiling elements will temporarily impact users and disrupt the work environment. Interior defects may interrupt the facility's operations, missions and safety.
1	Bad	**Assessment:** The interior system shows significant damage, corrosion, or deterioration. The interior is not providing an aesthetic function; flooring or floor coverings require replacement and interior surfaces require complete repainting. Ceilings require refurbishment. The entire interior needs to be replaced. Assessors reaction is to "Gut the building."	**User Impact:** The interior system is not safe. Without replacement of the interior, personnel, equipment and supplies will be exposed or damaged by its condition. Demolition will have to take place so that a new interior can be fabricated; this will impact the user and temporarily interrupt operations. During any floor replacement or painting or ceiling work entry into the area will be restricted.
E	**ELECTRICAL**	**Definition:** The electrical system in this sub-category applies to buildings that contain all service and distribution switches, switchgear, breakers, transformers, panels, grounding systems, lighting fixtures, branch wiring, telecommunications systems, and security and fire protection monitoring systems. This system has a relatively large (16%) CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible electrical defects. This system should work as new. There are no electrical code issues. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact (5):** There is no impact to the user; the system is functional and reliable. There are no electrical issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. Typically circuit breakers or switch gear need repairs. Equipment is modern and up to date. The system meets electrical code requirements. Monitoring systems are fully functional and provide reliable information. Wiring shows signs of aging but coatings are not cracking, dry, brittle or frayed. Minor corrective work is required.	**User Impact (4):** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.

3	Fair	**Assessment:** There are noticable defects. Equipment may be outdated but is mostly functional. There is a potential for electrical code violations. Monitoring systems function the majority of the time, but information may not be consistent. Wiring shows signs of aging with coatings that have very minor cracking and fraying or are dry and brittle Corrective work is required.	**User Impact (3):** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's electrical system may threaten or damage sensitive equipment if electrical service is interrupted or power surges occur. Electrical issues may affect the facility's operations, missions and safety. Inconsistant power resulting in surges may damage sensitive equipment, especially monitoring equipment, which could result in a large leak or discharge of fluids or gases. It will not effect storage or distribution of fluids but may effect generation and distribution of gases and propellants, which may effect other programs.
2	Poor	**Assessment:** Electrical defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. Does not meet all electrical codes. Distribution switches, switchgear, circuit breakers, transformers, and/or panels may need to be replaced. Monitoring systems may not function and information is inconsistant and unreliable. Wires are exposed with cracking and fraying, and they are dry and brittle. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the electrical system is unusable and/or unsafe. The system is not reliable; power supply is inconsistent and interrupted. Emergency generators are required to insure the most basic mission can be carried out. Electric motors, pumps, vacuums and other equipment can not be relied upon to function for the duration of a project. Significant corrrective work will impact users. The facility's operations, missions and safety will be affected. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials, large leaks or discharge of fluids/gases creating an environmental hazard. Repairs may have little impact on personnel or there may be little effect to storage or distribution of fluids but generation and distribution of gases will be so inconsistent and unreliable that programs dependent on these pressurized gases and propellants will come to a stop.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current electrical codes and are unsafe. Distribution switches, switchgear, breakers, transformers, and panels show rust and exposed circuitry. The grounding system fails. Communications equipment does not work. Monitoring systems do not function.	**User Impact:** The system is in complete shutdown; no liquids or gases can be safely stored or distributed in this facility. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of power for environmental services. Demolition will have to take place.

F	HVAC	**Definition:** The heating, ventilation, and air conditioning (HVAC) system in this sub-category applies to buildings that contain window mounted ac units and air circulation fans, exterior pad mounted DX units, air handlers, heating fans, exhaust fans, controls. This system may also contain chillers, chilled water distribution piping and pumps, boilers or hot water generators used for heating purposes, hot water heating distribution piping and heat pumps, and testing & balancing instrumentation. This system contributes a very small percentage to the CRV in this sub-category. Examples of HVAC systems within this sub-category includes facilities that are not actually buildings but systems designed to compress gases and distribute them using vacuum pumps and air handlers. In this sub-category, building HVAC systems are typically window mounted ac units.	**User Impact**
5	Excellent	**Assessment:** There are no visible HVAC system defects and air flow is adequately controlled. This system should work like new. Equipment room is clean and neat. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no HVAC issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the HVAC systems. Those parts include fan sheaves, drain pans, drain lines, control valves, insulation, etc. There are signs of system modifications but the equipment is modern and up to date. These systems meet appropriate building codes. Monitoring systems are fully functional and provide reliable information. Aging is evident in pipes and ducting. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding environmental control are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.

3	Fair	**Assessment:** There are noticable defects. An HVAC unit or two may be out of service awaiting parts for repair, or awaiting bearing replacements on air handlers and other fans. Although equipment may be outdated, this system is mostly functional. A large number of complaints are being reported by building users that say the system will not control temperature within the building. There is a potential for building code violations. Some signs of corrosion, leaking, alarm indicators in alarm and poor housekeeping are evident. Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A large number of complaints regarding environmental control are being reported by building users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's HVAC system may threaten or damage sensitive equipment or stored supplies if service is interrupted. HVAC issues may affect the facility's operations, missions and safety. System degradation may not effect storage or distribution of fluids but may effect generation and distribution of gases and propellants, which may in turn affect other programs.
2	Poor	**Assessment:** HVAC component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. Window mounted ac units and air circulation fans are being replaced on an irregular basis. Monitoring and control systems may not function. Piping, duct work, insulation, and control valves show significant signs of repair or replacement. Poor housekeeping and loose maintenance practices are producing excessive corrosion, air and water leakage, and alarm indications. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the HVAC system is unusable and/or unsafe. The system is not reliable; environmental controls are inconsistent. Significant corrrective work will shut off air conditioning or heat thus impacting users. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials. The facility's operations, missions and safety will be affected.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Window mounted ac units and air circulation fans do not work. Other HVAC systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of environmental services. Demolition will have to take place. The system's shutdown results in the shutdown of all programs that rely on pressurized gas and propellant distribution.

G	PLUMBING	**Definition:** The plumbing system within this sub-category consists of fire protection plumbing, potable water systems, a sanitary sewer, and bathrooms found in buildings. Components include all fixtures, piping, valves and associated pumpage equipment designed for the generation or distribution of any fluid or gas to other facilities. This system contributes a relatively large (22%) percentage to the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible plumbing system defects. This system should work like new. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no plumbing issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the plumbing system but there are no leaks at the flanges or fittings. Those parts include pipe flanges, valve fixtures, associated pumpage equipment, drain lines, control valves, house pumps and water tanks. There are signs of system modifications; it is possible to find the need for pump seal repairs or valve repacking. These systems meet appropriate building codes. Aging is evident in pipes. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding plumbing services are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Although plumbing may be older, this system is mostly functional. There is a potential for building code violations. Corrosion and leaking are noticeable on bathroom fixtures and system equipment. Piping system flanges and/or fittings leak; pooling is evident. Pump repairs and/or rebuilds are a common occurrence. Alarm indicators are in alarm and poor housekeeping is evident. Corrective work is required.	**User Impact:** The system is providing some functionality, reliability is questionable, and repairs may have minor impact on users. Leaks from the plumbing system may threaten or damage sensitive equipment. A large number of plumbing complaints are being reported by building users. Plumbing issues may affect the facility's operations, missions and safety [like leaks to the fire suppression system]. It will have minimal effect to the storage of fluids and gases but may effect distribution of fluids, gases and propellants, which may effect or delay other programs.

2	Poor	**Assessment:** Plumbing component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Fixtures and other system components may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. There are areas of large pooling and water containment; there is excessive corrosion, water leakage, and alarm indications; pumps and piping systems need complete sections replaced or complete rebuilds. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the plumbing system is unusable and/or unsafe. The system is not reliable; the fire suppression system can not be relied upon to adequately protect equipment, supplies, and personnel. Significant corrrective work may shut off plumbing services thus impacting users. Plumbing failures will result in damage to sensitive materials. The facility's operations, missions and safety will be affected. System defects will not effect storage of fluids fluids or gases, but distribution of fluids, gases, and propellants will be so inconsistent and unreliable that programs dependent on these pressurized gases and propellants will come to a stop.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Fixtures, pumps, and fire suppression piping does not work. Plumbing systems do not function.	**User Impact:** The system is in complete shutdown resulting in the shutdown of all programs that rely on fluids, pressurized gas, and propellant distribution. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of plumbing services. Demolition will have to take place.
H	**CONVEYANCE**	**Definition:** The conveyance system in this sub-category is not rated.	**User Impact**
5	Excellent		
4	Good		
3	Fair		
2	Poor		
1	Bad		
I	**PROGRAM SUPPORT EQUIPMENT**	**Definition:** Program support equipment is not rated in this sub-category.	**User Impact**
5	Excellent		
4	Good		
3	Fair		
2	Poor		
1	Bad		

D.4 Plumbing Facilities

A	STRUCTURE	Definition: The structure system in this sub-category applies to the foundations, super structure, slab, basement walls, floors, exterior stairways, loading docks, sidewalks, and parking lots [if they are found in buildings that house plumbing systems]. Examples of structural systems within this sub-category includes facilities that are not actually buildings but specialized plumbing facilities that include fluid storage vessels, tanks, major pipes or pipeline, and containment basins of assorted types. This system constitutes the largest (29%) percentage of the CRV for this sub-category.	User Impact
5	Excellent	**Assessment:** There are no visible structural defects. This system should appear and work as new. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no structural issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. These minor defects do not affect the structural integrity or intended use. Defects include misalignments in some of the main structural components that can be easily repaired; simple welds, re-attachment of hardware, etc. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Further deferment of action for these defects may affect the structural integrity or intended use of the facility. Defects include minor misalignment in the main structural components that requires substantial repair. Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety. Repairs to the structure system may temporarily affect plumbing operations.
2	Poor	**Assessment:** Structural defects such as bending or misalignment of superstructure are evident and require substantial repair. Significant corrective work or component replacement is required. Further deterioration could render the structure unusable.	**User Impact:** A large percentage of the structure system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require a capital project to repair the structure. Structural issues will affect the facility's operations, missions and safety. Repairs to the structure system will interrupt plumbing sub-category services. Because of possible safety issues entry into certain areas may be restricted.

1	Bad	**Assessment:** There is major settling of foundations and footings. Major bending of the superstructure is evident. Structure is un-repairable; demolition/replacement is required. Structure is unsafe and will not support the mission at all. Additional observations: _____	**User Impact:** The structure is not safe or usable. Entry into the facility is restricted or prohibited due to possible personnel safety concerns. The structure system will shut down the facility's operations and missions. Demolition will have to take place.
B	**ROOF**	**Definition:** The roof system in this sub-category applies to roofs in buildings that house plumbing components or equipment. For these, the roof consists of the roof covering, roof penetrations, gutters, and flashing. Roofs in this sub-category are typically used for equipment housing, operations controls and parts storage. This system has a small CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** Building roof is watertight, with positive drainage, and sound flashing and penetrations. The roof system is new or looks to be in new condition. Only normal preventive maintenance is required. Action items for corrective work should not exist. Additional observations: There is no evidence of deterioration other than surface flaws. Roof feels firm or solid to walk on.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no roof related issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. These minor defects do not affect the roof's watertight integrity or intended use. Minor corrective work is required. Additional observations: there is loose flashing, plugged drains, some evidence of patching, and minor cracking of the roof surface that has not resulted in leaks.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects; minor leaks are possible. Without corrective action, these defects may affect the watertight integrity of the roof system. Corrective work is required. At this level, there is no significant interior damage.	**User Impact:** The system is providing minimal functionality; reliability is questionable; and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety.

2	Poor	**Assessment:** The roof system is not waterproof. There are many defects including severe bubbling or cracking in composite roofing and standing water or substantial evidence of pooling in composite or other types of flat roofs. Significant repairs are required. There is significant leaking to the interior; there are substantial waterspots in ceiling tiles, bubbling in wall finishes or scaling on masonry type walls. A large percentage of the roof system is not functional because its integrity and reliability are highly questionable. Metal roofs may have rust through areas, missing fasteners and/or loose panels.	**User Impact:** A large percentage of the roof system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require a capital project funds to repair. The facility's operations, missions and safety will be affected. Repairs to the roof system will interrupt R&D services. Personnel safety may require a restricted access to certain areas.
1	Bad	**Assessment:** The roof system has significant leakage in many large areas. There is evidence of deterioration, drainage problems, and holes or cracks visible from inside the facility. The entire roof needs to be replaced. Re-roofing may also require the repair or replacement of wooden structural elements that support the roof (if applicable).	**User Impact:** Entry into spaces below the roof defects is restricted due to possible personnel safety issues. The facility, or major portions thereof, is uninhabitable due to leaks. Demolition will have to take place.
C	**EXTERIOR**	**Definition:** The exterior system for these facilities applies to exterior surfaces (including coatings and sealants), exterior walls, windows, and doors on buildings, sheds and trailers. The exterior surfaces or walls may be made of metal, brick, CMU, wood, or glass. This system has a small CRV percentage impact to this sub-category.	
5	Excellent	**Assessment:** There are no visible exterior defects. Exterior paint and surfaces are clean and look new. The exterior is considered watertight; the surfaces, paint coatings, and sealants are providing a complete weather barrier to the rest of the facility. There is no evidence of corrosion or surface deterioration. Doors and windows are fully functional and provide a good seal; gasket material is firm and shows no signs of cracking. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no exterior system issues that affect this facility's requirement to support NASA operations, missions and safety.

4	Good	**Assessment:** Minor exterior wall surface defects are present; minor rust or other corrosion on structural members; brick and mortar damage is visible with a small percentage needing replacement or repair. Some surface corrosion is evident; touch up painting is required. Small percentage of exterior window and door seals allow water to pass; exterior is not completely weatherproof. Some visible damage of leakage may be present. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** Exterior wall surface defects are present; limited brick and mortar damage is visible with a small percentage needing replacement or repair; a small percentage of metal siding needs replacement. Surface rust or corrosion is evident; painting is required for 25% of the surface area. Small percentage of exterior window and exterior door seals allow water to pass; exterior is not completely weatherproof. Leakage may be visible from inside the facility. Corrective work is required.	**User Impact:** The system is providing some functionality and reliability is questionable. Repairs to the exterior system such as exterior spot painting, calking and sealing leaks may require temporary relocation of sensitive equipment. Minor weatherproofing problems may inconvenience users. The deterioration of the facility's exterior system should not damage internal furniture or supplies. Energy effeciency may be reduced as well.
2	Poor	**Assessment:** Major exterior wall surface defects are present; brick and mortar damage is visible with a large percentage needing replacement or repair; significant sections of metal siding/skin are damaged and need repair or replacement. Significant surface corrosion is evident; painting is required for half of the surface area. A large percentage of exterior window and exterior door seals allow water to pass; exterior is creating weatherproof problems on other systems. Significant corrective work is required.	**User Impact:** A large percentage of the exterior system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require capital project funds. Weatherproofing problems will potentially damage the facility's contents. Energy effeciency is severely affected. Exterior defects will interrupt the facility's operations, missions and safety. Personnel safety may require a restricted access to certain areas.
1	Bad	**Assessment:** The exterior system has significant leakage in many large areas. There is significant evidence of deterioration, corrosion, and holes or cracks visible from inside the facility. The entire exterior system needs to be replaced. A significant percentage of exterior window and exterior door seals allow water to pass; the exterior is not weatherproof.	**User Impact:** The exterior system is not safe and in the case of brick or masonry facades, has the potential to collapse. Without replacement of the exterior, personnel, equipment and supplies will be exposed to weather and probably be damaged by its condition. Demolition will have to take place so that a new exterior can be fabricated; this will impact the user and temporarily interrupt operations.

D	INTERIOR FINISHES	**Definition:** The interior system consists of the interior wall finishes, floor coverings, ceilings, doors and stairs of the buildings that house equipment in this sub-category. It does not include any internal structural walls (load bearing) or weather insulation but it can include specialized material, i.e. acoustical and fire proof materials. This system has a small CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible interior defects. Interior paint and surfaces are clean and look new. The ceiling, flooring and wall materials are 100% intact; paint is continuous with no flaking; carpet and floor tiling show no fraying or chipping; ceiling tiles show no evidence of staining; stairway treds show no visible deterioration. Doors are fully functional. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no interior system issues that affect this facility's requirement to support NASA operations, missions and safety. The interior meets all requirements for it's intended work environment and is completely presentable.
4	Good	**Assessment:** Minor interior surface defects are present. There is evidence of very little marring, discoloration, fading or cracking. The ceiling, flooring and wall materials are mostly intact; touch up painting or spackling is required; carpet and floor tiling show little fraying or chipping; ceiling tiles show some staining; stairway treds have noticable deterioration. Small percentage of doors do not seal. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** Interior surface defects are present. Ceiling, flooring and wall materials show evidence of marring, discoloration, fading or cracking; painting is required for 25% of the surface area; carpet and floor tiling show some fraying or chipping; ceiling tiles show staining; some stairway treds need to be replaced. Small percentage of doors do not seal properly. Corrective work is required.	**User Impact:** The system is providing some functionality and reliability. Repairs to the interior system such as spot painting, calking and replacement of floor/ceiling tiles may require temporary relocation of personnel and sensitive equipment. Minor weatherproofing problems may inconvenience users.
2	Poor	**Assessment:** Major interior surface defects are present; wear and tear is excessive. Ceiling tiles, flooring and wall materials have broken or damaged elements; carpet and floor tiling show worn traffic patterns, broken/cracked/missing tiles, and visible subflooring. Walls have holes or furniture related damage. Ceiling tiles are stained, missing, or broken. Many stairway treds need to be replaced. A large percentage of doors do not seal properly. Significant corrective work is required.	**User Impact:** A large percentage of the interior system is unusable or reliability is highly questionable. Significant corrrective work such as replacement of flooring and ceiling elements will temporarily impact users and disrupt the work environment. Interior defects may interrupt the facility's operations, missions and safety.

1	Bad	**Assessment:** The interior system shows significant damage, corrosion, or deterioration. The interior is not providing an aesthetic function; flooring or floor coverings require replacement and interior surfaces require complete repainting. Ceilings require refurbishment. The entire interior needs to be replaced.	**User Impact:** The interior system is not safe. Without replacement of the interior, personnel, equipment and supplies will be exposed or damaged by its condition. Demolition will have to take place so that a new interior can be fabricated; this will impact the user and temporarily interrupt operations. During any floor replacement or painting or ceiling work entry into the area will be restricted.
E	**ELECTRICAL**	**Definition:** The electrical system in this sub-category applies to buildings that contain all service and distribution switches, switchgear, breakers, transformers, panels, grounding systems, lighting fixtures, branch wiring, telecommunications systems, and security and fire protection monitoring systems. This system has a relatively large (17%) CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible electrical defects. This system should work as new. There are no electrical code issues. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no electrical issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. Typically circuit breakers or switch gear need repairs. Equipment is modern and up to date. The system meets electrical code requirements. Monitoring systems are fully functional and provide reliable information. Wiring shows signs of aging but coatings are not cracking, dry, brittle or frayed. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Equipment may be outdated but is mostly functional. There is a potential for electrical code violations. Monitoring systems function the majority of the time, but information may not be consistent. Wiring shows signs of aging with coatings that have very minor cracking and fraying or are dry and brittle Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's electrical system may threaten or damage sensitive equipment if electrical service is interrupted or power surges occur. Electrical issues may affect the facility's operations, missions and safety.

2	Poor	**Assessment:** Electrical defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. Does not meet all electrical codes. Distribution switches, switchgear, circuit breakers, transformers, and/or panels may need to be replaced. Monitoring systems may not function and information is inconsistant and unreliable. Wires are exposed with cracking and fraying, and they are dry and brittle. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the electrical system is unusable and/or unsafe. The system is not reliable; power supply is inconsistent and interrupted. Emergency generators are required to insure the most basic mission can be carried out. Electric motors, pumps, vacuums and other equipment can not be relied upon to function for the duration of a project. Significant corrrective work will impact users. The facility's operations, missions and safety will be affected. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current electrical codes and are unsafe. Distribution switches, switchgear, breakers, transformers, and panels show rust and exposed circuitry. The grounding system fails. Communications equipment does not work. Monitoring systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of power for environmental services. Demolition will have to take place.
F	**HVAC**	**Definition:** The heating, ventilation, and air conditioning (HVAC) system in this sub-category applies to buildings that contain window mounted ac units and air circulation fans, exterior pad mounted DX units, air handlers, heating fans, exhaust fans, controls. This system may also contain chillers, chilled water distribution piping and pumps, boilers or hot water generators used for heating purposes, hot water heating distribution piping and heat pumps, and testing & balancing instrumentation. This system contributes a relatively large (12%) percentage to the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible HVAC system defects and air flow is adequately controlled. This system should work like new. Equipment room is clean and neat. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no HVAC issues that affect this facility's requirement to support NASA operations, missions and safety.

4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the HVAC systems. Those parts include fan sheaves, drain pans, drain lines, control valves, insulation, etc. There are signs of system modifications but the equipment is modern and up to date. These systems meet appropriate building codes. Monitoring systems are fully functional and provide reliable information. Aging is evident in pipes and ducting. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding environmental control are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. An HVAC unit or two may be out of service awaiting parts for repair, or awaiting bearing replacements on air handlers and other fans. Although equipment may be outdated, this system is mostly functional. A large number of complaints are being reported by building users that say the system will not control temperature within the building. There is a potential for building code violations. Some signs of corrosion, leaking, alarm indicators in alarm and poor housekeeping are evident. Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A large number of complaints regarding environmental control are being reported by building users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's HVAC system may threaten or damage sensitive equipment or stored supplies if service is interrupted. HVAC issues may affect the facility's operations, missions and safety.
2	Poor	**Assessment:** HVAC component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. Window mounted ac units and air circulation fans are being replaced on an irregular basis. Monitoring and control systems may not function. Piping, duct work, insulation, and control valves show significant signs of repair or replacement. Poor housekeeping and loose maintenance practices are producing excessive corrosion, air and water leakage, and alarm indications. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the HVAC system is unusable and/or unsafe. The system is not reliable; environmental controls are inconsistent. Significant corrrective work will shut off air conditioning or heat thus impacting users. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials. The facility's operations, missions and safety will be affected.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Window mounted ac units and air circulation fans do not work. Other HVAC systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of environmental services. Demolition will have to take place.

G	PLUMBING	**Definition:** The plumbing system within this sub-category consists of fire protection plumbing, potable water systems, a sanitary sewer, and bathrooms found in buildings. Components include all fixtures, piping, valves and associated pumpage equipment designed for the generation or distribution of any fluid or gas to other facilities. This system contributes a large (28%) percentage to the CRV in this sub-category. Included in this system is heavy utility equipment such as utility steam boilers, boiler feed water pumps, boiler feed water treatment systems, condensate return system equipment, utlity distribution chillers, chiller drive motors and gearboxes, chiller drive lube oil systems, evaporaters, condensors, chilled water distribution pumps, cooling towers, condensor water distribution pumps, cooling tower water treatment systems, natural gas piping, valves and regulators, large control air and utility air compressors and drive motors.	**User Impact**
5	Excellent	**Assessment:** There are no visible plumbing system defects. This system should work like new. Only normal preventive maintenance is required. Action items for corrective work should not exist. Most plumbing in these facilities is easier to assess than the other sub-catagories, since the majority of it is not encased within the walls.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no plumbing issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the plumbing system but there are no leaks at the flanges or fittings. Those parts include pipe flanges, valve fixtures, associated pumpage equipment, drain lines, control valves, house pumps and water tanks. There are signs of system modifications; it is possible to find the need for pump seal repairs or valve repacking. These systems meet appropriate building codes. Aging is evident in pipes. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding plumbing services are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Although plumbing may be older, this system is mostly functional. There is a potential for building code violations. Corrosion and leaking are noticeable on bathroom fixtures and system equipment. Piping system flanges and/or fittings leak; pooling is evident. Pump repairs and/or rebuilds are a common occurrence. Alarm indicators are in alarm and poor	**User Impact:** The system is providing some functionality, reliability is questionable, and repairs may have minor impact on users. Leaks from the plumbing system may threaten or damage sensitive equipment. A large number of plumbing complaints are being reported by building users. Plumbing issues may affect the facility's operations, missions and safety [like leaks to the fire suppression system].

		housekeeping is evident. Corrective work is required.	
2	Poor	**Assessment:** Plumbing component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Fixtures and other system components may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. There are areas of large pooling and water containment; there is excessive corrosion, water leakage, and alarm indications; pumps and piping systems need complete sections replaced or complete rebuilds. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the plumbing system is unusable and/or unsafe. The system is not reliable; the fire suppression system can not be relied upon to adequately protect equipment, supplies, and personnel. Significant corrrective work may shut off plumbing services thus impacting users. Plumbing failures will result in damage to sensitive materials. The facility's operations, missions and safety will be affected.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Fixtures, pumps, and fire suppression piping does not work. Plumbing systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of plumbing services. Demolition will have to take place.
H	**CONVEYANCE**	**Definition:** The conveyance system in this sub-category is not rated.	**User Impact**
5	Excellent		
4	Good		
3	Fair		
2	Poor		
1	Bad		
I	**PROGRAM SUPPORT EQUIPMENT**	**Definition:** Program support equipment is not rated in this sub-category.	**User Impact**
5	Excellent		
4	Good		
3	Fair		
2	Poor		
1	Bad		

D.5 Buildings

A	STRUCTURE	**Definition:** The structure system in this sub-category applies to the foundations, super structure, slab, basement walls, floors, exterior stairways, loading docks, sidewalks, and parking lots. This system constitutes a large (20%) percentage of the CRV for this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible structural defects. This system should appear and work as new. Only normal preventive maintenance is required. Action items for corrective work should not exist. Additional observations: There is 100% structural integrity of load bearing elements and foundations. Discoloration of concrete structural elements is allowed. There is no erosion or subsiding in the base or sub-base of asphalt parking lots.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no structural issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. These minor defects do not affect the structural integrity or intended use. Defects include misalignments in some of the main structural components that can be easily repaired; simple welds, re-attachment of hardware, etc. Minor corrective work is required. Additional observations: Very minor cracking or crazing which are only visual only defects. Load bearing elements do not appear to be affected. There are minor surface cracks with very limited erosion or subsiding in the base or sub-base of asphalt parking lots.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Further deferment of action for these defects may affect the structural integrity or intended use of the facility. Defects include minor misalignment in the main structural components that requires substantial repair. Corrective work is required. Additional observations: Limited erosion and/or subsiding of the base or sub-base of asphalt parking lots.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety. Repairs to the structure system may temporarily affect the building's operations.

2	Poor	**Assessment:** Structural defects such as bending or misalignment of superstructure are evident and require substantial repair. Significant corrective work or component replacement is required. Further deterioration could render the structure unusable. Additional observations: Visible settlement and/or other structural defects such as significant cracking in the slab, foundation or load bearing elements. Significant erosion and/or subsiding in the base or sub-base or asphalt parking lots.	**User Impact:** A large percentage of the structure system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require a capital project to repair the structure. Structural issues will affect the facility's operations, missions and safety. Repairs to the structure system will interrupt normal building services. The required repairs are extensive enough that concurrent habitation is not practicable in part or all of the facility. Users will not be able to use the facility for an extended period while repairs are effected.
1	Bad	**Assessment:** There is major settling of foundations and footings. Major bending of the superstructure is evident. Structure is un-repairable; demolition/replacement is required. Structure is unsafe and will not support the mission at all. Additional observations: Large areas of settling, major cracks and loss of structural integrity in the slab, foundation or load bearing elements. Major erosion and subsiding of the base and/or sub-base of asphalt parking lots.	**User Impact:** The structure is not safe or usable. Entry into the facility is restricted or prohibited due to possible personnel safety concerns. The structure system will shut down the facility's operations and missions. Demolition will have to take place.
B	**ROOF**	**Definition:** The roof system in this sub-category applies to all building roofs. For these, the roof consists of the roof covering, roof penetrations, gutters, and flashing. Roofs in this sub-category are typically made of all types of materials. This system has a small CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** Building roof is watertight, with positive drainage, and sound flashing and penetrations. The roof system is new or looks to be in new condition. Only normal preventive maintenance is required. Action items for corrective work should not exist. Additional observations: There is no evidence of deterioration other than surface flaws. Roof feels firm or solid to walk on.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no roof related issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. These minor defects do not affect the roof's watertight integrity or intended use. Minor corrective work is required. Additional observations: there is loose flashing, plugged drains, some evidence of patching, and minor cracking of the roof surface that has not resulted in leaks.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.

3	Fair	**Assessment:** There are noticable defects; minor leaks are possible. Without corrective action, these defects may affect the watertight integrity of the roof system. Corrective work is required. At this level, there is no significant interior damage. Additional observations: Bubbling and some cracking is evident in composite or built up roofing. There is limited standing water or evidence of pooling in composite or other types of flat roofs. There may be evidence of substantial patching. The interior of a facility may show limited waterspots in ceiling tiles, bubbling in wall finishes or scaling on masonry type walls. Metal roofs may require coating to seal minor leaks, they may have surface rust and may have some panel fasteners missing. Roof system may have minor areas that do not feel solid to walk on. There are significant drainage problems with standing water after rainfall.	**User Impact:** The system is providing minimal functionality; reliability is questionable; and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety.
2	Poor	**Assessment:** The roof system is not waterproof. There are many defects including severe bubbling or cracking in composite roofing and standing water or substantial evidence of pooling in composite or other types of flat roofs. Significant repairs are required. There is significant leaking to the interior; there are substantial waterspots in ceiling tiles, bubbling in wall finishes or scaling on masonry type walls. A large percentage of the roof system is not functional because its integrity and reliability are highly questionable. Metal roofs may have rust through areas, missing fasteners and/or loose panels. Roof has significant areas that are soft or "mushy" to walk on. There are major drainage problems; large areas have standing water after rainfall.	**User Impact:** A large percentage of the roof system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require a capital project funds to repair. The facility's operations, missions and safety will be affected. Repairs to the roof system will interrupt R&D services. Personnel safety may require a restricted access to certain areas.
1	Bad	**Assessment:** The roof system has significant leakage in many large areas. There is evidence of deterioration, drainage problems, and holes or cracks visible from inside the facility. The entire roof needs to be replaced. Re-roofing may also require the repair or replacement of wooden structural elements that support the roof (if applicable).	**User Impact:** Entry into spaces below the roof defects is restricted due to possible personnel safety issues. The facility, or major portions thereof, is uninhabitable due to leaks. Demolition will have to take place. Users would be better off with their office outside.

C	EXTERIOR	**Definition:** The exterior system for these facilities applies to exterior surfaces (including coatings and sealants), exterior walls, windows, and doors on buildings, sheds and trailers. The exterior surfaces or walls may be made of metal, brick, CMU, wood, or glass. This system has a relatively large (16%) percentage CRV percentage impact to this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible exterior defects. Exterior paint and surfaces are clean and look new. The exterior is considered watertight; the surfaces, paint coatings, and sealants are providing a complete weather barrier to the rest of the facility. There is no evidence of corrosion or surface deterioration. Doors and windows are fully functional and provide a good seal; gasket material is firm and shows no signs of cracking. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no exterior system issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** Minor exterior wall surface defects are present; minor rust or other corrosion on structural members; brick and mortar damage is visible with a small percentage needing replacement or repair. Some surface corrosion is evident; touch up painting is required. Small percentage of exterior window and door seals allow water to pass; exterior is not completely weatherproof. Some visible damage of leakage may be present. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** Exterior wall surface defects are present; limited brick and mortar damage is visible with a small percentage needing replacement or repair; a small percentage of metal siding needs replacement. Surface rust or corrosion is evident; painting is required for 25% of the surface area. Small percentage of exterior window and exterior door seals allow water to pass; exterior is not completely weatherproof. Leakage may be visible from inside the facility. Corrective work is required.	**User Impact:** The system is providing some functionality and reliability is questionable. Repairs to the exterior system such as exterior spot painting, calking and sealing leaks may require temporary relocation of sensitive equipment. Minor weatherproofing problems may inconvenience users. The deterioration of the facility's exterior system should not damage internal furniture or supplies. Energy effeciency may be reduced as well.

2	Poor	**Assessment:** Major exterior wall surface defects are present; brick and mortar damage is visible with a large percentage needing replacement or repair; significant sections of metal siding/skin are damaged and need repair or replacement. Significant surface corrosion is evident; painting is required for half of the surface area. A large percentage of exterior window and exterior door seals allow water to pass; exterior is creating weatherproof problems on other systems. Significant corrective work is required.	**User Impact:** A large percentage of the exterior system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require capital project funds. Weatherproofing problems will potentially damage the facility's contents. Energy effeciency is severely affected. Exterior defects will interrupt the facility's operations, missions and safety. Personnel safety may require a restricted access to certain areas. The appearance of the facility is not acceptable and would be an embarrasment to NASA.
1	Bad	**Assessment:** The exterior system has significant leakage in many large areas and is possibly unsafe. There is significant evidence of deterioration, corrosion, and holes or cracks visible from inside the facility. The entire exterior system needs to be replaced. A significant percentage of exterior window and exterior door seals allow water to pass; the exterior is not weatherproof. Extensive crumbling or collapse of brick and mortar. Many exterior doors and windows are broken.	**User Impact:** The exterior system is not safe and in the case of brick or masonry facades, has the potential to collapse. Without replacement of the exterior, personnel, equipment and supplies will be exposed to weather and probably be damaged by its condition. Demolition will have to take place so that a new exterior can be fabricated; this will impact the user and temporarily interrupt operations. The appearance of the facility is not acceptable and would be an embarrasment to NASA.
D	**INTERIOR FINISHES**	**Definition:** The interior system consists of the interior wall finishes, floor coverings, ceilings, doors and stairs of the buildings that house equipment in this sub-category. It does not include any internal structural walls (load bearing) or weather insulation but it can include specialized material, i.e. acoustical and fire proof materials. This system has a relatively large (14%) CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible interior defects. Interior paint and surfaces are clean and look new. The ceiling, flooring and wall materials are 100% intact; paint is continuous with no flaking; carpet and floor tiling show no fraying or chipping; ceiling tiles show no evidence of staining; stairway treds show no visible deterioration. Doors are fully functional. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no interior system issues that affect this facility's requirement to support NASA operations, missions and safety. The interior meets all requirements for it's intended work environment and is completely presentable.

4	Good	**Assessment:** Minor interior surface defects are present. There is evidence of very little marring, discoloration, fading or cracking. The ceiling, flooring and wall materials are mostly intact; touch up painting or spackling is required; carpet and floor tiling show little fraying or chipping; ceiling tiles show some staining; stairway treds have noticable deterioration. Small percentage of doors do not seal. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** Interior surface defects are present. Ceiling, flooring and wall materials show evidence of marring, discoloration, fading or cracking; painting is required for 25% of the surface area; carpet and floor tiling show some fraying or chipping; ceiling tiles show staining; some stairway treds need to be replaced. Small percentage of doors do not seal properly. Corrective work is required. Sheetrock needs minor repairs.	**User Impact:** The system is providing some functionality and reliability. Repairs to the interior system such as spot painting, calking and replacement of floor/ceiling tiles may require temporary relocation of personnel and sensitive equipment. Minor weatherproofing problems may inconvenience users.
2	Poor	**Assessment:** Major interior surface defects are present; wear and tear is excessive. Ceiling tiles, flooring and wall materials have broken or damaged elements; carpet and floor tiling show worn traffic patterns, broken/cracked/missing tiles, and visible subflooring. Walls have holes or furniture related damage. Ceiling tiles are stained, missing, or broken. Many stairway treds need to be replaced. A large percentage of doors do not seal properly. Significant corrective work is required.	**User Impact:** A large percentage of the interior system is unusable or reliability is highly questionable. Significant corrrective work such as replacement of flooring and ceiling elements will temporarily impact users and disrupt the work environment. Interior defects may interrupt the facility's operations, missions and safety.
1	Bad	**Assessment:** The interior system shows significant damage, corrosion, or deterioration. The interior is not providing an aesthetic function; flooring or floor coverings require replacement and interior surfaces require complete repainting. Ceilings require refurbishment. The entire interior needs to be replaced. Extensive if not total sheetrock repair and replacement are required.	**User Impact:** The interior system is not safe. Without replacement of the interior, personnel, equipment and supplies will be exposed or damaged by its condition. Demolition will have to take place so that a new interior can be fabricated; this will impact the users and temporarily interrupt operations. During any floor replacement or painting or ceiling work entry into the area will be restricted. The interior meets no requirements for its intended work environment and is not at all presentable since it would be embarrassing to NASA.

E	ELECTRICAL	**Definition:** The electrical system in this sub-category applies to buildings that contain all service and distribution switches, switchgear, breakers, transformers, breaker panels, grounding systems, lighting fixtures, branch wiring, telecommunications systems, and security and fire protection monitoring systems. This system has a large (20%) CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible electrical defects. This system should work as new. There are no electrical code issues. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no electrical issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. Typically circuit breakers or switch gear need repairs. Equipment is modern and up to date. The system meets electrical code requirements. Monitoring systems are fully functional and provide reliable information. Wiring shows signs of aging but coatings are not cracking, dry, brittle or frayed. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Equipment may be outdated but is mostly functional. There is a potential for electrical code violations. Monitoring systems function the majority of the time, but information may not be consistent. Wiring shows signs of aging with coatings that have very minor cracking and fraying or are dry and brittle Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's electrical system may threaten or damage sensitive equipment if electrical service is interrupted or power surges occur. Electrical issues may affect the facility's operations, missions and safety.
2	Poor	**Assessment:** Electrical defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. Does not meet all electrical codes. Distribution switches, switchgear, circuit breakers, transformers, and/or panels may need to be replaced. Monitoring systems may not function and information is inconsistant and unreliable. Wires are exposed with cracking and fraying, and they are dry and brittle. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the electrical system is unusable and/or unsafe. The system is not reliable; power supply is inconsistent and interrupted. Emergency generators are required to insure the most basic mission can be carried out. Electric motors, pumps, vacuums and other equipment can not be relied upon to function for the duration of a project. Significant corrrective work will impact users. The facility's operations, missions and safety will be affected. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials.

1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current electrical codes and are unsafe. Distribution switches, switchgear, breakers, transformers, and panels show rust and exposed circuitry. The grounding system fails. Communications equipment does not work. Monitoring systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of power for environmental services. Demolition will have to take place.
F	**HVAC**	**Definition:** The heating, ventilation, and air conditioning (HVAC) system in this sub-category applies to buildings that contain window mounted ac units and air circulation fans, exterior pad mounted DX units, air handlers, heating fans, exhaust fans, controls. This system may also contain chillers, chilled water distribution piping and pumps, boilers or hot water generators used for heating purposes, hot water heating distribution piping and heat pumps, and testing & balancing instrumentation. This system contributes a relatively large (13%) percentage to the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible HVAC system defects and air flow is adequately controlled. This system should work like new. Equipment room is clean and neat. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no HVAC issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the HVAC systems. Those parts include fan sheaves, drain pans, drain lines, control valves, insulation, etc. There are signs of system modifications but the equipment is modern and up to date. These systems meet appropriate building codes. Monitoring systems are fully functional and provide reliable information. Aging is evident in pipes and ducting. Minor corrective work is required. There are very few if any complaints from building users that the system will not control temperature in building.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding environmental control are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.

3	Fair	**Assessment:** There are noticable defects. An HVAC unit or two may be out of service awaiting parts for repair, or awaiting bearing replacements on air handlers and other fans. Although equipment may be outdated, this system is mostly functional. A large number of complaints are being reported by building users that say the system will not control temperature within the building. There is a potential for building code violations. Some signs of corrosion, leaking, alarm indicators in alarm and poor housekeeping are evident. Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A large number of complaints regarding environmental control are being reported by building users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's HVAC system may threaten or damage sensitive equipment or stored supplies if service is interrupted. HVAC issues may affect the facility's operations, missions and safety.
2	Poor	**Assessment:** HVAC component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. Window mounted ac units and air circulation fans are being replaced on an irregular basis. Monitoring and control systems may not function. Piping, duct work, insulation, and control valves show significant signs of repair or replacement. Poor housekeeping and loose maintenance practices are producing excessive corrosion, air and water leakage, and alarm indications. Significant corrective work or component replacement is required. There are a high number of complaints from building users that system will not control temperature in building and/or that the system creates excessive noise and vibration that can be heard or felt in the habitable spaces.	**User Impact:** A large percentage of the HVAC system is unusable and/or unsafe. The system is not reliable; environmental controls are inconsistent. Significant corrrective work will shut off air conditioning or heat thus impacting users. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials. The facility's operations, missions and safety will be affected.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Window mounted ac units and air circulation fans do not work. Other HVAC systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of environmental services. Demolition will have to take place.

G	PLUMBING	**Definition:** The plumbing system within this sub-category consists of fire protection plumbing, potable water systems, a sanitary sewer, and bathrooms found in buildings. Components include all fixtures, piping, valves and associated pumpage equipment. This system contributes a small percentage to the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible plumbing system defects. This system should work like new. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no plumbing issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the plumbing system but there are no leaks at the flanges or fittings. Those parts include pipe flanges, valve fixtures, associated pumpage equipment, drain lines, control valves, house pumps and water tanks. There are signs of system modifications; it is possible to find the need for pump seal repairs or valve repacking. These systems meet appropriate building codes. Aging is evident in pipes. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding plumbing services are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Although plumbing may be older, this system is mostly functional. There is a potential for building code violations. Corrosion and leaking are noticeable on bathroom fixtures and system equipment. Piping system flanges and/or fittings leak; pooling is evident. Pump repairs and/or rebuilds are a common occurrence. Alarm indicators are in alarm and poor housekeeping is evident. Corrective work is required.	**User Impact:** The system is providing some functionality, reliability is questionable, and repairs may have minor impact on users for a short period of time. Leaks from the plumbing system may threaten or damage sensitive equipment. A large number of plumbing complaints are being reported by building users. Plumbing issues may affect the facility's operations, missions and safety [like leaks to the fire suppression system].
2	Poor	**Assessment:** Plumbing component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Fixtures and other system components may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. There are areas of large pooling and water containment; there is excessive corrosion, water leakage, and alarm indications; pumps and piping systems need complete sections replaced or complete rebuilds. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the plumbing system is unusable and/or unsafe. The system is not reliable; the fire suppression system can not be relied upon to adequately protect equipment, supplies, and personnel. Significant corrrective work may shut off plumbing services thus impacting users. Plumbing failures will result in damage to sensitive materials. The facility's operations, missions and safety will be affected.

1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Fixtures, pumps, and fire suppression piping does not work. Plumbing systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of plumbing services. Demolition will have to take place.
H	**CONVEYANCE**	**Definition:** The conveyance system in this sub-category consists of the personnel or maintenance elevators, escalators, cranes over 50 tons and other specialized lifts. This system contributes a very small percentage of the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible conveyance system defects. This system should work like new. Certification is up-to-date. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no conveyance issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticable but minor defects. There is some evidence of recent replacement to parts within the conveyance system but system is certified. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticable defects. Although the system may be older, it is mostly functional; the system is certified. There is a potential for building code violations. Corrosion and leaking are noticeable on system components. Corrective work is required.	**User Impact:** The system is providing some functionality, reliability is questionable, and repairs may have minor impact on users for a short period of time. Conveyance issues may affect the facility's operations, missions and safety.
2	Poor	**Assessment:** Conveyance component defects are evident and require substantial repair or replacement; system may not be certified. System experiences infrequent failures. System components may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the conveyance system is unusable and/or unsafe; this system should not be used until re-certified. The system is not reliable and needs to be inspected.
1	Bad	**Assessment:** The system is un-repairable; replacement is required because user is unable to maintain certification. Repair parts are not readily available due to age. System does not meet current building codes and is unsafe. Conveyance systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out. Demolition will have to take place.

I	PROGRAM SUPPORT EQUIPMENT	**Definition:** Program support equipment is not rated in this sub-category.	User Impact
5	Excellent		
4	Good		
3	Fair		
2	Poor		
1	Bad		

D.6 Storage Facilities

A	STRUCTURE	**Definition:** The structure system in this sub-category applies to the foundations, super structure, slab, basement walls, floors, exterior stairways, loading docks, sidewalks, and parking lots. Examples of structural systems within this sub-category includes facilities that are not actually buildings but specialized storage facilities that include portable HAZMAT structures, explosive magazines, and open storage sheds made of wood, metal or masonry. This system constitutes the largest (57%) percentage of the CRV for this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible structural defects. This system should appear and work as new. Only normal preventive maintenance is required. Action items for corrective work should not exist. Additional observations: If any crazing or cracking is identified it is so minor that it doesn't affect the structural integrity of the facility.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no structural issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticeable but minor defects. These minor defects do not affect the structural integrity or intended use. Defects include misalignments in some of the main structural components that can be easily repaired; simple welds, re-attachment of hardware, etc. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticeable defects. Further deferment of action for these defects may affect the structural integrity or intended use of the facility. Defects include minor misalignment in the main structural components that requires substantial repair. Corrective work is required. Additional observations: Crazing or cracking or other material defects are visible.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety. Repairs to the structure system may require temporary relocation of sensitive storage equipment.
2	Poor	**Assessment:** Structural defects such as bending or misalignment of superstructure are evident and require substantial repair. Significant corrective work or component replacement is required. Further deterioration could render the structure unusable.	**User Impact:** A large percentage of the structure system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require a capital project to repair the structure. Structural issues will affect the facility's operations, missions and safety. Repairs to the structure system will interrupt R&D services. Personnel safety may require a restricted access to certain areas.

1	Bad	**Assessment:** There is major settling of foundations and footings. Major bending of the superstructure is evident. Structure is un-repairable; demolition/replacement is required. Structure is unsafe and will not support the mission at all.	**User Impact:** The structure is not safe or usable. Entry into the facility is restricted or prohibited due to possible personnel safety concerns. The structure system will shut down the facility's operations and missions. Demolition will have to take place.
B	**ROOF**	**Definition:** The roof system in this sub-category applies to roofs in buildings that store components or equipment. For these, the roof consists of the roof covering, roof penetrations, gutters, and flashing. Roofs in this sub-category are typically roll roofing or gravel composite or shingles or galvanized metal. This system has a small (10%) CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** Building roof is watertight, with positive drainage, and sound flashing and penetrations. The roof system is new or looks to be in new condition. Only normal preventive maintenance is required. Action items for corrective work should not exist. Additional observations: There is no evidence of deterioration other than surface flaws. Roof feels firm or solid to walk on.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no roof related issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticeable but minor defects. These minor defects do not affect the roof's watertight integrity or intended use. Minor corrective work is required. Additional observations: there is loose flashing, plugged drains, some evidence of patching, and minor cracking of the roof surface that has not resulted in leaks.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticeable defects; minor leaks are possible. Without corrective action, these defects may affect the watertight integrity of the roof system. Corrective work is required. At this level, there is no significant interior damage. Additional observations: Bubbling and some cracking is evident in composite or built up roofing. There is limited standing water or evidence of pooling in composite or other types of flat roofs. There may be evidence of substantial patching. The interior of a facility may show limited waterspots in ceiling tiles, bubbling in wall finishes or scaling on masonry type walls. Metal roofs may require coating to seal minor leaks, they may have surface rust and may have some panel fasteners missing.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety. Repairs to the roof system may require temporary relocation of sensitive storage equipment. The water saturation of roof insulation is causing the rise of heating and cooling costs.

2	Poor	**Assessment:** The roof system is not waterproof. There are many defects including severe bubbling or cracking in composite roofing and standing water or substantial evidence of pooling in composite or other types of flat roofs. Significant repairs are required. There is significant leaking to the interior; there are substantial water spots in ceiling tiles, bubbling in wall finishes or scaling on masonry type walls. A large percentage of the roof system is not functional because its integrity and reliability are highly questionable. Metal roofs may have rust through areas, missing fasteners and/or loose panels.	**User Impact:** A large percentage of the roof system is unusable or reliability is highly questionable. Significant corrective work will impact users. Cost of corrective work will require a capital project funds to repair. The facility's operations, missions, and safety will be affected. Repairs to the roof system will interrupt R&D services. Personnel safety may require a restricted access to certain areas.
1	Bad	**Assessment:** The roof system has significant leakage in many large areas. There is evidence of deterioration, drainage problems, and holes or cracks visible from inside the facility. The entire roof needs to be replaced. Re-roofing may also require the repair or replacement of wooden structural elements that support the roof (if applicable).	**User Impact:** Entry into spaces below the roof defects is restricted due to possible personnel safety issues. The facility, or major portions thereof, is uninhabitable due to leaks. Demolition will have to take place.
C	**EXTERIOR**	**Definition:** The exterior system for these facilities applies to exterior surfaces (including coatings and sealants), exterior walls, windows, and doors on buildings, sheds and trailers. The exterior surfaces or walls may be made of metal, brick, CMU, wood, or glass. This system has a relatively large (17%) CRV percentage impact to this sub-category. Coatings and sealants are important in keeping exterior systems from deteriorating more quickly than normal.	**User Impact**
5	Excellent	**Assessment:** There are no visible exterior defects. Exterior paint and surfaces are clean and look new. The exterior is considered watertight; the surfaces, paint coatings, and sealants are providing a complete weather barrier to the rest of the facility. There is no evidence of corrosion or surface deterioration. Doors and windows are fully functional and provide a good seal; gasket material is firm and shows no signs of cracking. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no exterior system issues that affect this facility's requirement to support NASA operations, missions, and safety.

4	Good	**Assessment:** Exterior wall surface defects are present; limited brick and mortar damage is visible with a small percentage needing replacement or repair; a small percentage of metal siding needs replacement. Surface rust or corrosion is evident; painting is required for 25% of the surface area. Small percentage of exterior window and exterior door seals allow water to pass; exterior is not completely weatherproof. Leakage may be visible from inside the facility. Corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** A larger number of minor repairs are required. Wear and tear is visually noticeable although the exterior is still considered watertight, with few exceptions. Brick and mortar damage is visible and a larger percentage of it needs replacement or repair. Metal siding needs a large amount of touch up painting to deter corrosion. A small percentage of exterior window and exterior door seals allow water to pass. Some visible damage for this leakage may be present.	**User Impact:** The system is providing some functionality and reliability is questionable. Repairs to the exterior system such as exterior spot painting, calking and sealing leaks may require temporary relocation of sensitive equipment. Minor weatherproofing problems may inconvenience users. The deterioration of the facility's exterior system should not damage internal furniture or supplies. Energy effeciency may be reduced as well.
2	Poor	**Assessment:** Major exterior wall surface defects are present; brick and mortar damage is visible with a large percentage needing replacement or repair; significant sections of metal siding/skin are damaged and need repair or replacement. Significant surface corrosion is evident; painting is required for half of the surface area. A large percentage of exterior window and exterior door seals allow water to pass; exterior is creating weatherproof problems on other systems. Significant corrective work is required.	**User Impact:** A large percentage of the exterior system is unusable or reliability is highly questionable. Significant corrrective work will impact users. Cost of corrective work will require capital project funds. Weatherproofing problems will potentially damage the facility's contents. Energy effeciency is severely affected. Exterior defects will interrupt the facility's operations, missions and safety. Personnel safety may require a restricted access to certain areas.
1	Bad	**Assessment:** The exterior system has significant leakage in many large areas. There is significant evidence of deterioration, corrosion, and holes or cracks visible from inside the facility. The entire exterior system needs to be replaced. A significant percentage of exterior window and exterior door seals allow water to pass; the exterior is not weatherproof.	**User Impact:** The exterior system is not safe and in the case of brick or masonry facades, has the potential to collapse. Without replacement of the exterior, personnel, equipment and supplies will be exposed to weather and probably be damaged by its condition. Demolition will have to take place so that a new exterior can be fabricated; this will impact the user and temporarily interrupt operations.

D	INTERIOR FINISHES	**Definition:** The interior system consists of the interior wall finishes, floor coverings, ceilings, doors and stairs of the buildings that house equipment in this sub-category. It does not include any internal structural walls (load bearing) or weather insulation but it can include specialized material, i.e. acoustical and fire proof materials. This system has a small CRV percentage impact to the sub-category. The interior finishes in storage facilities primarily provide an aesthetic function.	**User Impact**
5	Excellent	**Assessment:** There are no visible interior defects. Interior paint and surfaces are clean and look new. The ceiling, flooring and wall materials are 100% intact; paint is continuous with no flaking; carpet and floor tiling show no fraying or chipping; ceiling tiles show no evidence of staining; stairway treads show no visible deterioration. Doors are fully functional. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no interior system issues that affect this facility's requirement to support NASA operations, missions, and safety. The interior meets all requirements for its intended work environment and is completely presentable.
4	Good	**Assessment:** Minor interior surface defects are present. There is evidence of very little marring, discoloration, fading or cracking. The ceiling, flooring and wall materials are mostly intact; touch up painting or spackling is required; carpet and floor tiling show little fraying or chipping; ceiling tiles show some staining; stairway treads have noticeable deterioration. Small percentage of doors do not seal. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** Interior surface defects are present. Ceiling, flooring and wall materials show evidence of marring, discoloration, fading or cracking; painting is required for 25% of the surface area; carpet and floor tiling show some fraying or chipping; ceiling tiles show staining; some stairway treads need to be replaced. Small percentage of doors do not seal properly. Corrective work is required.	**User Impact:** The system is providing some functionality and reliability. Repairs to the interior system such as spot painting, calking and replacement of floor/ceiling tiles may require temporary relocation of personnel and sensitive equipment. Minor weatherproofing problems may inconvenience users.

2	Poor	**Assessment:** Major interior surface defects are present; wear and tear is excessive. Ceiling tiles, flooring and wall materials have broken or damaged elements; carpet and floor tiling show worn traffic patterns, broken/cracked/missing tiles, and visible sub flooring. Walls have holes or furniture related damage. Ceiling tiles are stained, missing, or broken. Many stairway treads need to be replaced. A large percentage of doors do not seal properly. Significant corrective work is required.	**User Impact:** A large percentage of the interior system is unusable or reliability is highly questionable. Significant corrective work such as replacement of flooring and ceiling elements will temporarily impact users and disrupt the work environment. Interior defects may interrupt the facility's operations, missions, and safety. Since storage facilities are usually not inhabited, there should be little impact to the user if significant repairs are needed. Most of the interior finish work is for aesthetics.
1	Bad	**Assessment:** The interior system shows significant damage, corrosion, or deterioration. The interior is not providing an aesthetic function; flooring or floor coverings require replacement and interior surfaces require complete repainting. Ceilings require refurbishment. The entire interior needs to be replaced.	**User Impact:** The interior system is not safe and in the case of brick or masonry facades, has the potential to collapse. Without replacement of the exterior, personnel, equipment and supplies will be exposed to weather and probably be damaged by its condition. Demolition will have to take place so that a new exterior can be fabricated; this will impact the user and temporarily interrupt operations. Since personnel don't spend much time in storage facilities, there should be little impact to the user if significant repairs are needed but not done.
E	**ELECTRICAL**	**Definition:** The electrical system in this sub-category applies to buildings that contain all service and distribution switches, switchgear, breakers, transformers, breaker panels, grounding systems, lighting fixtures, branch wiring, telecommunications systems, and security and fire protection monitoring systems. This system has a small CRV percentage impact to the sub-category. Additionally, depending on size and specialization of the storage facility it may contain grounding straps and explosion proof fixtures. This system is also driven by building codes and stringent safety procedures.	**User Impact**
5	Excellent	**Assessment:** There are no visible electrical defects. This system should work as new. There are no electrical code issues. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no electrical issues that affect this facility's requirement to support NASA operations, missions and safety.

4	Good	**Assessment:** There are noticeable but minor defects. Typically circuit breakers or switch gear need repairs. Equipment is modern and up to date. The system meets electrical code requirements. Monitoring systems are fully functional and provide reliable information. Wiring shows signs of aging but coatings are not cracking, dry, brittle or frayed. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticeable defects. Equipment may be outdated but is mostly functional. There is a potential for electrical code violations. Monitoring systems function the majority of the time, but information may not be consistent. Wiring shows signs of aging with coatings that have very minor cracking and fraying or are dry and brittle. Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's electrical system may threaten or damage sensitive equipment if electrical service is interrupted or power surges occur. Electrical issues may affect the facility's operations, missions and safety. Storage facilities requiring high power consumption (due to environmental controls) may experience surges or interruptions.
2	Poor	**Assessment:** Electrical defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. Does not meet all electrical codes. Distribution switches, switchgear, circuit breakers, transformers, and/or panels may need to be replaced. Monitoring systems may not function and information is inconsistant and unreliable. Wires are exposed with cracking and fraying, and they are dry and brittle. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the electrical system is unusable and/or unsafe. The system is not reliable; power supply is inconsistent and interrupted. Emergency generators are required to insure the most basic mission can be carried out. Electric motors, pumps, vacuums and other equipment can not be relied upon to function for the duration of a project. Significant corrective work will impact users. The facility's operations, missions, and safety will be affected. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials. Stored equipment may be labeled as unreliable for use on future projects. Emergency power generators will be needed for specialized storage facilities and magazines to insure the most basic mission can be carried out.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current electrical codes and are unsafe. Distribution switches, switchgear, breakers, transformers, and panels show rust and exposed circuitry. The grounding system fails. Communications equipment does not work. Monitoring systems do not function.	**User Impact:** The system is in complete shutdown; material cannot be safely stored in this facility. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of power for environmental services. Demolition will have to take place.

F	HVAC	**Definition:** The heating, ventilation, and air conditioning (HVAC) system in this sub-category applies to storage facilities that contain window mounted ac units and air circulation fans. In addition, specialized storage facilities may use HVAC systems such as exterior pad mounted DX units, air handlers, heating fans, exhaust fans, controls. This system may also contain chillers, chilled water distribution piping and pumps, boilers or hot water generators used for heating purposes, hot water heating distribution piping and heat pumps, and testing & balancing instrumentation. This system contributes a small percentage to the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible HVAC system defects and air flow is adequately controlled. This system should work like new. Equipment room is clean and neat. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no HVAC issues that affect this facility's requirement to support NASA operations, missions, and safety.
4	Good	**Assessment:** There are noticeable but minor defects. There is some evidence of recent replacement to parts within the HVAC systems. Those parts include fan sheaves, drain pans, drain lines, control valves, insulation, etc. There are signs of system modifications but the equipment is modern and up to date. These systems meet appropriate building codes. Monitoring systems are fully functional and provide reliable information. Aging is evident in pipes and ducting. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Although many storage facilities are usually not inhabited minor complaints regarding environmental control are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticeable defects. An HVAC unit or two may be out of service awaiting parts for repair, or awaiting bearing replacements on air handlers and other fans. Although equipment may be outdated, this system is mostly functional. A large number of complaints are being reported by building users that say the system will not control temperature within the building. There is a potential for building code violations. Some signs of corrosion, leaking, alarm indicators in alarm and poor housekeeping are evident. Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A large number of complaints regarding environmental control are being reported by building users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's HVAC system may threaten or damage sensitive equipment or stored supplies if service is interrupted. HVAC issues may affect the facility's operations, missions and safety.

2	Poor	**Assessment:** HVAC component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. Window mounted ac units and air circulation fans are being replaced on an irregular basis. Monitoring and control systems may not function. Piping, ductwork, insulation, and control valves show significant signs of repair or replacement. Poor housekeeping and loose maintenance practices are producing excessive corrosion, air and water leakage, and alarm indications. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the HVAC system is unusable and/or unsafe. The system is not reliable; environmental controls are inconsistent. Significant corrective work will shut off air conditioning or heat thus impacting users. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials. The facility's operations, missions and safety will be affected. Stored equipment may be labeled as unreliable for use on future projects. Emergency HVAC systems will be needed for specialized storage facilities and magazines to insure the most basic mission can be carried out.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Window mounted ac units and air circulation fans do not work. Specialized storage facilities have HVAC systems that do not function.	**User Impact:** The system is in complete shutdown; material cannot be safely stored in this facility. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of environmental services. Demolition will have to take place.
G	**PLUMBING**	**Definition:** The plumbing system within this sub-category consists mainly of fire protection plumbing. This sub category may also have potable water systems, a sanitary sewer, and bathrooms. Components include all piping and valves and associated pumpage equipment. This system contributes a small percentage to the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible plumbing system defects. This system should work like new. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no plumbing issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticeable but minor defects. There is some evidence of recent replacement to parts within the plumbing system but there are no leaks at the flanges or fittings. Those parts include pipe flanges, valve fixtures, associated pumpage equipment, drain lines, control valves, house pumps and water tanks. There are signs of system modifications; it is possible to find the need for pump seal repairs or valve repacking. These systems meet appropriate building codes. Aging is evident in pipes. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding plumbing services are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.

3	Fair	**Assessment:** There are noticeable defects. Although plumbing may be older, this system is mostly functional. There is a potential for building code violations. Corrosion and leaking are noticeable on bathroom fixtures and system equipment. Piping system flanges and/or fittings leak; pooling is evident. Pump repairs and/or rebuilds are a common occurrence. Alarm indicators are in alarm and poor housekeeping is evident. Corrective work is required.	**User Impact:** The system is providing some functionality, reliability is questionable, and repairs may have minor impact on users. Leaks from the plumbing system may threaten or damage sensitive equipment. A large number of plumbing complaints are being reported by building users. Plumbing issues may affect the facility's operations, missions and safety. Fire suppression system for this storage facility requires repairs.
2	Poor	**Assessment:** Plumbing component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Fixtures and other system components may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. There are areas of large pooling and water containment; there is excessive corrosion, water leakage, and alarm indications; pumps and piping systems need complete sections replaced or complete rebuilds. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the plumbing system is unusable and/or unsafe. The system is not reliable; the fire suppression system can not be relied upon to adequately protect stored equipment, supplies, and personnel. Significant corrective work may shut off plumbing services thus impacting users. Plumbing failures will result in damage to sensitive materials. The facility's operations, missions and safety will be affected. Stored equipment may be labeled as unreliable for use on future projects.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Fixtures, pumps, and fire suppression piping does not work. Specialized storage facilities have plumbing systems that do not function.	**User Impact:** The system is in complete shutdown; material cannot be safely stored in this facility. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of plumbing services. Demolition will have to take place. Programs that rely on the storage of specialized material will be shut down.
H	**CONVEYANCE**	**Definition:** The conveyance system in this sub-category is not rated.	**User Impact**
5	Excellent		
4	Good		
3	Fair		
2	Poor		
1	Bad		
I	**PROGRAM SUPPORT EQUIPMENT**	**Definition:** Program support equipment is not rated in this sub-category.	**User Impact**
5	Excellent		
4	Good		
3	Fair		

2	Poor		
1	Bad		

D.7 Miscellaneous Facilities

A	STRUCTURE	**Definition:** The structure system in this sub-category applies to the foundations, super structure, slab, basement walls, floors, exterior stairways, loading docks, sidewalks, and parking lots [if they are part of buildings]. Examples of structural systems within this sub-category includes facilities that are not actually buildings but specialized facilities that include airfields, roads, and parking lot paving; pedestrian and vehicle bridges; sidewalks and outdoor lighting supports; security fencing; railroad road beds, tracks, bridge and vehicle loading ramps; leased trailers; grandstands; water front structures such as wharfs, bulkheads, seawalls, mooring dolphins, docks, locks, canals, harbors, channels, and boat slips and launch ramps; storm sewers and drains, dams, drainage ditches, retaining walls; and administrative structures such as flag poles, signs, monuments and exhibits. This system represents the largest (92%) percentage of the CRV for this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible structural defects. This system should appear and work as new. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no structural issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticeable but minor defects. These minor defects do not affect the structural integrity or intended use. Defects include misalignments in some of the main structural components that can be easily repaired; simple welds, re-attachment of hardware, etc. Minor corrective work is required. Additional observations: Storm drains, gutters and culverts may be dirty or damaged; earthen structures are showing signs of minor washing, and water runoff is affecting foundations or earth structures.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.

3	Fair	**Assessment:** There are noticeable defects. Further deferment of action for these defects may affect the structural integrity or intended use of the facility. Defects include minor misalignment in the main structural components that requires substantial repair. Corrective work is required. Additional observations: Inspection may reveal cracking, crazing, and rusting; erosion of bridge foundations, water front structures, administrative structures, roadways, parking lots, and sidewalks; pot holes in roadway and parking lot paving; deteriorating railroad ties, and other wood structures; silting in canals, lock area, and harbor; washes in earthen structures; and/or other visual defects. Corrective work may involve surface treatment of parking lot because of cracking; repairing road and parking lot pot holes; repairing washes with earth fill, sandbags, or riprap; replacing railroad ties or some wood components of grandstands or water front structures; repairing the railroad bed; and unclogging storm sewers.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety. Repairs to the structure system may affect traffic flow or parking could be affected while potholes are repaired, or surfaces are being treated.
2	Poor	**Assessment:** Structural defects such as bending or misalignment of superstructure are evident and require substantial repair. Significant corrective work or component replacement is required. Further deterioration could render the structure unusable. Additional observations: Inspection may reveal visible settlement of foundations; structural defects such as severe deterioration of bridge structure and connecting elements; rusted security fencing and washes evident under fence; boats using canal, harbor, or channel are sucking silt into cooling systems; broken components in grandstands; sidewalks cracked with settlement occurring; paved areas base and/or sub-base deteriorating from lack of surface maintenance; railroad ties severely deteriorated, excessively worn railroad rails, and washes evident in roadbed; storm sewers are severely clogged or collapsed as evidenced by flooding; and other visible structural defects.	**User Impact:** A large percentage of the structure system is unusable or reliability is highly questionable. Significant corrective work will impact users. Cost of corrective work will require a capital project to repair the structure. Structural issues will affect the facility's operations, missions and safety. Repairs to the structure system will interrupt specific services for this sub-category. Significant repairs of road and parking lot paving will impact users. A canal, harbor, and channel with a poor rating because of silting will delay shipment of Shuttle components such as an External Tank being shipped to KSC if the boats cooling system is fouled with silt.

1	Bad	**Assessment:** There is major settling of foundations and footings. Major bending of the superstructure is evident. Structure is un-repairable; demolition/replacement is required. Structure is unsafe and will not support the mission at all. Additional observations: Silting of lock, canal, harbor, or channel at this rating would be so severe that boat captains would refuse to use the waterway. Roads with this rating would be so deteriorated that they would not be safe to use. Bridges would be closed to traffic.	**User Impact:** The structure is not safe or usable. Entry into the facility is restricted or prohibited due to possible personnel safety concerns. The structure system will shut down the facility's operations and missions. Demolition will have to take place. The element must be replaced or undergo major renovation to be functional and reliable.
B	**ROOF**	**Definition:** The roof system in this sub-category applies to roofs for small support facilities, trailers, sheds, and a picnic pavilion that have roofs. For these, the roof consists of the roof covering, roof openings, gutters, and flashing. Roofs in this sub-category are typically built-up or metal type. This system has a very small CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** Building roof is watertight, with positive drainage, and sound flashing and penetrations. The roof system is new or looks to be in new condition. Only normal preventive maintenance is required. Action items for corrective work should not exist. Additional observations: There is no evidence of deterioration other than surface flaws. Roof feels firm or solid to walk on.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no roof related issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticeable but minor defects. These minor defects do not affect the roof's watertight integrity or intended use. Minor corrective work is required. Additional observations: there is loose flashing, plugged drains, some evidence of patching, and minor cracking of the roof surface that has not resulted in leaks.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.

3	Fair	**Assessment:** There are noticeable defects; minor leaks are possible. Without corrective action, these defects may affect the watertight integrity of the roof system. Corrective work is required. At this level, there is no significant interior damage. Additional observations: Bubbling and some cracking is evident in composite or built up roofing. There is limited standing water or evidence of pooling in composite or other types of flat roofs. There may be evidence of substantial patching. The interior of a facility may show limited water spots in ceiling tiles, bubbling in wall finishes or scaling on masonry type walls. Metal roofs may require coating to seal minor leaks, they may have surface rust and may have some panel fasteners missing.	**User Impact:** The system is providing minimal functionality; reliability is questionable; and repairs may have minor impact on the users. A failure could affect other systems. Engineering involvement is possible because required repairs will result in a capital project. Structural issues may affect the facility's operations, missions and safety.
2	Poor	**Assessment:** The roof system is not waterproof. There are many defects including severe bubbling or cracking in composite roofing and standing water or substantial evidence of pooling in composite or other types of flat roofs. Significant repairs are required. There is significant leaking to the interior; there are substantial water spots in ceiling tiles, bubbling in wall finishes, or scaling on masonry type walls. A large percentage of the roof system is not functional because its integrity and reliability are highly questionable. Metal roofs may have rust through areas, missing fasteners and/or loose panels.	**User Impact:** A large percentage of the roof system is unusable or reliability is highly questionable. Significant corrective work will impact users. Cost of corrective work will require a capital project funds to repair. The facility's operations, missions and safety will be affected. Repairs to the roof system will interrupt R&D services. Personnel safety may require a restricted access to certain areas.
1	Bad	**Assessment:** The roof system has significant leakage in many large areas. There is evidence of deterioration, drainage problems, and holes or cracks visible from inside the facility. The entire roof needs to be replaced. Re-roofing may also require the repair or replacement of wooden structural elements that support the roof (if applicable).	**User Impact:** Entry into spaces below the roof defects is restricted due to possible personnel safety issues. The facility, or major portions thereof, is uninhabitable due to leaks. Demolition will have to take place.

C	EXTERIOR	**Definition:** The exterior system for these facilities applies to exterior surfaces (including coatings and sealants), exterior walls, windows, and doors on buildings, sheds and trailers. The exterior surfaces or walls may be made of metal, brick, CMU, wood, or glass. This system has a small CRV percentage impact to this sub-category. The exterior system may consists of the skin of the structural components or superstructures such as bridges, lighting supports, signs, monuments and exhibits.	**User Impact**
5	Excellent	**Assessment:** There are no visible exterior defects. Exterior paint and surfaces are clean and look new. The exterior is considered watertight; the surfaces, paint coatings, and sealants are providing a complete weather barrier to the rest of the facility. There is no evidence of corrosion or surface deterioration. Doors and windows are fully functional and provide a good seal; gasket material is firm and shows no signs of cracking. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no exterior system issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** Minor exterior wall surface defects are present; minor rust or other corrosion on structural members; brick and mortar damage is visible with a small percentage needing replacement or repair. Some surface corrosion is evident; touch up painting is required. Small percentage of exterior window and door seals allow water to pass; exterior is not completely weatherproof. Some visible damage of leakage may be present. Minor corrective work is required. Corrective work on buildings and trailers may include weatherproofing around exterior window seals and exterior door seals. Corrective work on bridges could be minor spot painting of exterior bridge surfaces with no corrosion showing. Metal siding may need small amount of touch-up painting; possible corrosion issues are not present.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.

3	Fair	**Assessment:** Exterior wall surface defects are present; limited brick and mortar damage is visible with a small percentage needing replacement or repair; a small percentage of metal siding needs replacement. Surface rust or corrosion is evident; painting is required for 25% of the surface area. Small percentage of exterior window and exterior door seals allow water to pass; exterior is not completely weatherproof. Leakage may be visible from inside the facility. Corrective work is required. Bridge surfaces show corrosion and require spot painting.	**User Impact:** The system is providing some functionality and reliability is questionable. Repairs to the exterior system such as exterior spot painting, calking and sealing leaks may require temporary relocation of sensitive equipment. Minor weatherproofing problems may inconvenience users. The deterioration of the facility's exterior system should not damage internal furniture or supplies. Energy effeciency may be reduced as well.
2	Poor	**Assessment:** Major exterior wall surface defects are present; brick and mortar damage is visible with a large percentage needing replacement or repair; significant sections of metal siding/skin are damaged and need repair or replacement. Significant surface corrosion is evident; painting is required for half of the surface area. A large percentage of exterior window and exterior door seals allow water to pass; exterior is creating weatherproof problems on other systems. Significant corrective work is required. Bridge surfaces and connecting elements exhibit corrosion.	**User Impact:** A large percentage of the exterior system is unusable or reliability is highly questionable. Significant corrective work will impact users. Cost of corrective work will require capital project funds. Weatherproofing problems will potentially damage the facility's contents. Energy efficiency is severely affected. Exterior defects will interrupt the facility's operations, missions and safety. Personnel safety may require a restricted access to certain areas. The repair of exterior surfaces (painting) and installing weatherproof sealants on doors and windows should have little or no impact on users. Spot painting the bridges may cause some minor disruption to traffic flow.
1	Bad	**Assessment:** The exterior system has significant leakage in many large areas. There is significant evidence of deterioration, corrosion, and holes or cracks visible from inside the facility. The entire exterior system needs to be replaced. A significant percentage of exterior window and exterior door seals allow water to pass; the exterior is not weatherproof. Extensive corrosion is present on metal siding and on bridge structures. Sand blasting or some other cleaning of the surface would be required before painting.	**User Impact:** The exterior system is not safe and in the case of brick or masonry facades, has the potential to collapse. Without replacement of the exterior, personnel, equipment and supplies will be exposed to weather and probably be damaged by its condition. Demolition will have to take place so that a new exterior can be fabricated; this will impact the user and temporarily interrupt operations. Sand blasting and painting operations on metal siding will impact the user of the facility. Because of possible safety issues entry into certain areas may be restricted. The sand blasting and painting of a bridge may cause temporary interruptions to traffic flow.

D	INTERIOR FINISHES	**Definition:** The interior system consists of the interior wall finishes, floor coverings, ceilings, doors and stairs of the buildings that house equipment in this sub-category. It does not include any internal structural walls (load bearing) or weather insulation but it does include specialized material i.e. acoustical and fire proof materials. This system has a very small CRV percentage impact to the sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible interior defects. Interior paint and surfaces are clean and look new. The ceiling, flooring and wall materials are 100% intact; paint is continuous with no flaking; carpet and floor tiling show no fraying or chipping; ceiling tiles show no evidence of staining; stairway treads show no visible deterioration. Doors are fully functional. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no interior system issues that affect this facility's requirement to support NASA operations, missions and safety. The interior meets all requirements for it's intended work environment and is completely presentable.
4	Good	**Assessment:** Minor interior surface defects are present. There is evidence of very little marring, discoloration, fading or cracking. The ceiling, flooring and wall materials are mostly intact; touch up painting or spackling is required; carpet and floor tiling show little fraying or chipping; ceiling tiles show some staining; stairway treads have noticeable deterioration. Small percentage of doors do not seal. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** Interior surface defects are present. Ceiling, flooring and wall materials show evidence of marring, discoloration, fading or cracking; painting is required for 25% of the surface area; carpet and floor tiling show some fraying or chipping; ceiling tiles show staining; some stairway treads need to be replaced. Small percentage of doors do not seal properly. Corrective work is required.	**User Impact:** The system is providing some functionality and reliability. Repairs to the interior system such as spot painting, calking and replacement of floor/ceiling tiles may require temporary relocation of personnel and sensitive equipment. Minor weatherproofing problems may inconvenience users.
2	Poor	**Assessment:** Major interior surface defects are present; wear and tear is excessive. Ceiling tiles, flooring and wall materials have broken or damaged elements; carpet and floor tiling show worn traffic patterns, broken/cracked/missing tiles, and visible sub flooring. Walls have holes or furniture related damage. Ceiling tiles are stained, missing, or broken. Many stairway treads need to be replaced. A large percentage of doors do not seal properly. Significant corrective work is required.	**User Impact:** A large percentage of the interior system is unusable or reliability is highly questionable. Significant corrective work such as replacement of flooring and ceiling elements will temporarily impact users and disrupt the work environment. Interior defects may interrupt the facility's operations, missions and safety.

1	Bad	**Assessment:** The interior system shows significant damage, corrosion, or deterioration. The interior is not providing an aesthetic function; flooring or floor coverings require replacement and interior surfaces require complete repainting. Ceilings require refurbishment. The entire interior needs to be replaced.	**User Impact:** The interior system is not safe. Without replacement of the interior, personnel, equipment and supplies will be exposed or damaged by its condition. Demolition will have to take place so that a new interior can be fabricated; this will impact the user and temporarily interrupt operations. During any floor replacement or painting or ceiling work entry into the area will be restricted.
E	**ELECTRICAL**	**Definition:** The electrical system in this sub-category applies to buildings that contain all service and distribution switches, switchgear, breakers, transformers, breaker panels, grounding systems, lighting fixtures, branch wiring, telecommunications systems, and security and fire protection monitoring systems. This system has a small CRV percentage impact to the sub-category. This system includes lighting for the Shuttle and other airfield runways, taxiways and parking areas; streets and parking lots; traffic control and security.	**User Impact**
5	Excellent	**Assessment:** There are no visible electrical defects. This system should work as new. There are no electrical code issues. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no electrical issues that affect this facility's requirement to support NASA operations, missions, and safety.
4	Good	**Assessment:** There are noticeable but minor defects. Typically circuit breakers or switch gear need repairs. Equipment is modern and up to date. The system meets electrical code requirements. Monitoring systems are fully functional and provide reliable information. Wiring shows signs of aging but coatings are not cracking, dry, brittle or frayed. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. This system's reliability is not significantly jeopardizing the facility's operations, missions, and safety.

3	Fair	**Assessment:** There are noticeable defects. Equipment may be outdated but is mostly functional. There is a potential for electrical code violations. Monitoring systems function the majority of the time, but information may not be consistent. Wiring shows signs of aging with coatings that have very minor cracking and fraying or are dry and brittle Corrective work is required. With this rating reliability is unacceptable for such systems as runway approach and landing lighting, security lighting, fire alarms, and bascule bridge operations.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's electrical system may threaten or damage sensitive equipment if electrical service is interrupted or power surges occur. Electrical issues may affect the facility's operations, missions and safety. Failure of the airfield approach or lighting systems could impact landing of an Orbiter or aircraft. Electrical failure at a bascule bridge could affect water traffic or land vehicle traffic. These failures would significantly impact the users of these facilities.
2	Poor	**Assessment:** Electrical defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. Does not meet all electrical codes. Distribution switches, switchgear, circuit breakers, transformers, and/or panels may need to be replaced. Monitoring systems may not function and information is inconsistent and unreliable. Wires are exposed with cracking and fraying, and they are dry and brittle. Significant corrective work or component replacement is required. System not fully functional for buildings, airfield or bridge.	**User Impact:** A large percentage of the electrical system is unusable and/or unsafe. The system is not reliable; power supply is inconsistent and interrupted. Emergency generators are required to insure the most basic mission can be carried out. Electric motors, pumps, vacuums and other equipment can not be relied upon to function for the duration of a project. Significant corrective work will impact users. The facility's operations, missions and safety will be affected. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials. A failure of the system could impact the user by having to divert a landing to another airfield should the approach and/or runway lights fail. A bascule bridge could be stuck in the open or down position affecting boat or vehicle traffic.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current electrical codes and are unsafe. Distribution switches, switchgear, breakers, transformers, and panels show rust and exposed circuitry. The grounding system fails. Communications equipment does not work. Monitoring systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of power for environmental services. Demolition will have to take place.

F	HVAC	**Definition:** The heating, ventilation, and air conditioning (HVAC) system in this sub-category applies to buildings that contain window mounted ac units and air circulation fans, exterior pad mounted DX units, air handlers, heating fans, exhaust fans, controls. This system may also contain chillers, chilled water distribution piping and pumps, boilers or hot water generators used for heating purposes, hot water heating distribution piping and heat pumps, and testing & balancing instrumentation. This system contributes a small percentage to the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible HVAC system defects and air flow is adequately controlled. This system should work like new. Equipment room is clean and neat. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no HVAC issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticeable but minor defects. There is some evidence of recent replacement to parts within the HVAC systems. Those parts include fan sheaves, drain pans, drain lines, control valves, insulation, etc. There are signs of system modifications but the equipment is modern and up to date. These systems meet appropriate building codes. Monitoring systems are fully functional and provide reliable information. Aging is evident in pipes and ducting. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding environmental control are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.
3	Fair	**Assessment:** There are noticeable defects. An HVAC unit or two may be out of service awaiting parts for repair, or awaiting bearing replacements on air handlers and other fans. Although equipment may be outdated, this system is mostly functional. A large number of complaints are being reported by building users that say the system will not control temperature within the building. There is a potential for building code violations. Some signs of corrosion, leaking, alarm indicators in alarm and poor housekeeping are evident. Corrective work is required.	**User Impact:** The system is providing minimal functionality, reliability is questionable, and repairs may have minor impact on users. A large number of complaints regarding environmental control are being reported by building users. A failure could affect other systems or degrade the facility's capabilities. The deterioration of the facility's HVAC system may threaten or damage sensitive equipment or stored supplies if service is interrupted. HVAC issues may affect the facility's operations, missions and safety.

2	Poor	**Assessment:** HVAC component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Some components of the systems may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. Window mounted ac units and air circulation fans are being replaced on an irregular basis. Monitoring and control systems may not function. Piping, duct work, insulation, and control valves show significant signs of repair or replacement. Poor housekeeping and loose maintenance practices are producing excessive corrosion, air and water leakage, and alarm indications. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the HVAC system is unusable and/or unsafe. The system is not reliable; environmental controls are inconsistent. Significant corrective work will shut off air conditioning or heat thus impacting users. Monitoring systems are unreliable or will fail to operate, which can result in damage to sensitive materials. The facility's operations, missions and safety will be affected.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Window mounted ac units and air circulation fans do not work. Other HVAC systems do not function.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of environmental services. Demolition will have to take place.
G	**PLUMBING**	**Definition:** The plumbing system within this sub-category consists of fire protection plumbing, potable water systems, a sanitary sewer, and bathrooms found in buildings. Components include all fixtures, piping, valves and associated pumpage equipment. This system contributes a very small percentage to the CRV in this sub-category.	**User Impact**
5	Excellent	**Assessment:** There are no visible plumbing system defects. This system should work like new. Only normal preventive maintenance is required. Action items for corrective work should not exist.	**User Impact:** There is no impact to the user; the system is functional and reliable. There are no plumbing issues that affect this facility's requirement to support NASA operations, missions and safety.
4	Good	**Assessment:** There are noticeable but minor defects. There is some evidence of recent replacement to parts within the plumbing system but there are no leaks at the flanges or fittings. Those parts include pipe flanges, valve fixtures, associated pumpage equipment, drain lines, control valves, house pumps and water tanks. There are signs of system modifications; it is possible to find the need for pump seal repairs or valve repacking. These systems meet appropriate building codes. Aging is evident in pipes. Minor corrective work is required.	**User Impact:** The system is functioning as intended, but corrective work is managed so that there is no impact on the user. Minor complaints regarding plumbing services are being reported by personnel. This system's reliability is not significantly jeopardizing the facility's operations, missions and safety.

3	Fair	**Assessment:** There are noticeable defects. Although plumbing may be older, this system is mostly functional. There is a potential for building code violations. Corrosion and leaking are noticeable on bathroom fixtures and system equipment. Piping system flanges and/or fittings leak; pooling is evident. Pump repairs and/or rebuilds are a common occurrence. Alarm indicators are in alarm and poor housekeeping is evident. Corrective work is required.	**User Impact:** The system is providing some functionality, reliability is questionable, and repairs may have minor impact on users for a short period of time. Leaks from the plumbing system may threaten or damage sensitive equipment. A large number of plumbing complaints are being reported by building users. Plumbing issues may affect the facility's operations, missions and safety [like leaks to the fire suppression system].
2	Poor	**Assessment:** Plumbing component defects are evident and require substantial repair or replacement. System experiences infrequent failures. Fixtures and other system components may be obsolete; equipment age is becoming a factor. It does not meet all current building codes. There are areas of large pooling and water containment; there is excessive corrosion, water leakage, and alarm indications; pumps and piping systems need complete sections replaced or complete rebuilds. Significant corrective work or component replacement is required.	**User Impact:** A large percentage of the plumbing system is unusable and/or unsafe. The system is not reliable; the fire suppression system can not be relied upon to adequately protect equipment, supplies, and personnel. Significant corrective work may shut off plumbing services thus impacting users. Plumbing failures will result in damage to sensitive materials. The facility's operations, missions, and safety will be affected. Major repairs may shutdown bathrooms thus impacting users. Should a major failure of the water or sewer piping occur it could flood the adjacent area and impact operations in the area.
1	Bad	**Assessment:** The system is un-repairable; replacement is required. Repair parts are not readily available due to age. Systems do not meet current building codes and are unsafe. Fixtures, pumps, and fire suppression piping does not work.	**User Impact:** The system is in complete shutdown. The system is tagged out and entry into the area is restricted due to probable personnel safety issues. The facility, or major portions thereof, is uninhabitable due to lack of plumbing services. Demolition will have to take place.
H	**CONVEYANCE**	**Definition:** The conveyance system in this sub-category is not rated.	**User Impact**
5	Excellent		
4	Good		
3	Fair		
2	Poor		
1	Bad		
I	**PROGRAM SUPPORT EQUIPMENT**	**Definition:** Program support equipment is not rated in this sub-category.	**User Impact**
5	Excellent		
4	Good		
3	Fair		

2	Poor		
1	Bad		